

ANNEX A

FIRE ENTRAPMENT INVESTIGATION & REVIEW GUIDELINES

DEFINITIONS:

Agency Administrator--That lead employee having responsibility for management of land and/or resources on an organizational unit, and having accountability for overall results of management actions.

Entrapment--A situation where personnel are unexpectedly caught in a fire behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or have been compromised. An entrapment may or may not include deployment of a fire shelter for its intended purpose. These situations may or may not result in injury. They include "near misses".

ENTRAPMENT INVESTIGATION ELEMENTS:

The following elements most commonly contribute to entrapment situations. As a minimum, each of these elements should be addressed in an entrapment investigation and subsequent report, even if the investigation indicates that the element did not contribute to the entrapment. Exhibit I, "Entrapment Investigation Element Matrix", may be utilized to expedite the process.

- | | |
|---|--|
| <p>I. FIRE BEHAVIOR</p> <ul style="list-style-type: none">FuelsWeatherTopographyPredicted vs. Observed | <p>IV. CONTROL MECHANISMS</p> <ul style="list-style-type: none">Span of ControlCommunicationsOngoing Evaluations"10 Standard Fire Orders/18 Watchout Situations" |
| <p>II. ENVIRONMENTAL FACTORS</p> <ul style="list-style-type: none">SmokeTemperatureVisibilitySlopeOther | <p>V. INVOLVED PERSONNEL PROFILES</p> <ul style="list-style-type: none">Training/QualificationsOperational Period Length/FatigueAttitudesLeadershipExperience Levels |
| <p>III. INCIDENT MANAGEMENT</p> <ul style="list-style-type: none">Incident ObjectivesStrategyTacticsSafety Briefings/Major Concerns AddressedInstructions Given | <p>VI. EQUIPMENT</p> <ul style="list-style-type: none">AvailabilityPerformance/Non-performanceClothing and Equipment Used for Intended Purpose?Etc. |

MANAGEMENT AND COMMAND RESPONSIBILITIES

Incident Commander Responsibilities (in addition to those identified in ICS 410-1, "Fireline Handbook")

Upon notification of an entrapment, the Incident Commander should consider:

1. Removing involved personnel from the fireline, ensuring appropriate medical attention as necessary. When hospitalization or fatalities occur, relevant facilities and organizations should be advised to preserve all involved personnel's protective clothing and equipment.
2. Ensuring that the entrapment or deployment scene is secured and that all pertinent evidentiary items are secured (in place if possible), particularly fire shelters and personal protective equipment as required by the Occupational Safety and Health Act.
3. Immediately notifying the DNRC Line Officer and providing details on the incident status summary (ICS-209).
4. Initiating a preliminary investigation of the entrapment or deployment to determine the facts of the entrapment, insofar as possible. The initial investigation will be completed within 24 hours of the entrapment.
5. Relieving involved supervisors from fireline duty until the preliminary investigation has been completed.
6. Ensuring that personnel and supervisors are readily available for interviews by the Entrapment Investigation Team (EIT, below defined). "Available" means present at the incident base or nearby R&R center.
7. As soon as possible, providing the results of the Incident Commander's preliminary investigation to the Entrapment Investigation Team. Ensure preparation of a roster of individuals involved in the entrapment. The roster must minimally contain their names, employing agency, genders, ages, addresses, incident position titles, and appropriate employee identification numbers.

Agency Administrator Responsibilities

Upon notification of an entrapment or deployment, the Agency Administrator should assure that the following activities take place within 24 hours of notification:

1. Convene an Entrapment Investigation Team (EIT) to investigate the entrapment. It is recommended that the EIT be interagency in nature and should include personnel with the following skill areas:
 - a. Incident Commander or Operation's Section Chief (Type I).
 - b. Fire Behavior Analyst, qualified in the specific fuel type.
 - c. Safety Officer, with investigative expertise.

- d. Wildfire Operations, with expertise at the peer level of the person(s) directly involved.
 - e. Agency Representative of involved person(s).
 - f. Employee representation (union, peer at operations level).
 - g. Fire weather meteorology.
 - h. Personal protective equipment specialist, from a lab such as the USDA Forest Service's Missoula Technology and Development Center.
- 2. Instruct the EIT to arrive on scene within 24 hours.
 - 3. Advise the Incident Management Team of the EIT's time of arrival and team composition.
 - 4. As required by the Occupational Safety and Health Act of 1970, advise the nearest office of the Occupational Safety and Health Administration (federal or state as applicable) if the entrapment involves a fatality or the hospitalization of 5 or more personnel. Advise OSHA office that a formal investigation is being conducted by a designated Entrapment Investigation Team.
 - 5. Arrange for a critical incident stress debriefing team for the personnel involved in the entrapment.
 - 6. Notify the home unit agency administrator of all individuals involved in the entrapment/deployment.
 - 7. Submit a copy of the EIT's final report to the NWCG Safety and Health Working Team within 60 days of receipt from the EIT.

Entrapment Investigation Team Responsibilities

- 1. The EIT will conduct the investigation, identify causal factors and list findings for the entrapment situation. Recommendations for corrective actions should be included in the letter of transmittal.
- 2. The EIT will brief the Agency Administrator and the Incident Commander of their preliminary findings prior to leaving the incident.
- 3. Within 30 days of the EIT's dispatch, the EIT's final report and recommendations for corrective actions will be submitted to the Agency Administrator.

NWCG Safety and Health Working Team (SHWT) Responsibilities

1. Within 30 days of receipt of each entrapment report, the SHWT will distribute a summary of the applicable findings to NWCG agencies and the National Fire Protection Association, per the NWCG "Safety Gram." This summary will not include any incriminating agency references or information identified as sensitive by the agency.
2. The SHWT will periodically review all entrapment reports, determine trends, and incorporate findings to develop specific prevention recommendations for implementation by NWCG agencies.

ENTRAPMENT INVESTIGATION ELEMENT MATRIX

I. FIRE BEHAVIOR

	Did Not Contribute	*Influenced	*Significant Contribution
Fuels			
Weather			
Topography			
Predicted vs. Observed			

II. ENVIRONMENTAL FACTORS

	Did Not Contribute	*Influenced	*Significant Contribution
Smoke			
Temperature			
Visibility			
Slope			
Other			

III. INCIDENT MANAGEMENT

	Did Not Contribute	*Influenced	*Significant Contribution
Incident Objectives			
Strategy			
Tactics			
Safety Briefings/Major Concerns Addressed			
Instructions Given			

**Element items must be supported with written documentation.*

IV. CONTROL MECHANISMS

	Did Not Contribute	*Influenced	*Significant Contribution
Span of Control			
Communications			
Ongoing Evaluations			
“10 Standard Fire Orders/18 Watchout Situations”.			

V. INVOLVED PERSONNEL PROFILES

	Did Not Contribute	*Influenced	*Significant Contribution
Training/Qualifications			
Operational Period Length/Fatigue			
Attitudes			
Leadership			
Experience Levels			

**Element items must be supported with written documentation.*

VI. EQUIPMENT

	Did Not Contribute	*Influenced	*Significant Contribution
Availability			
Performance/Non- performance			
Clothing and Equipment			
Used for Intended Purpose?			

**Element items must be supported with written documentation.*

ANNEX B

LINE OFFICER'S BRIEFING

LINE OFFICER'S BRIEFING

*A format for preparing and conducting the line officer's briefing
to the incident management team.*

A. INTRODUCTION

The line officer's (agency administrator's) briefing is a crucial procedure that should be given thorough attention and preparation, in consideration of the general hurried state of business during the transition between extended attack, an escaped fire and the anticipation of an incident management team.

The line officer's briefing will provide information, guidance, and direction, including constraints, necessary for the successful management of the incident.

The briefing must be provided any time an incident management team is assigned, including changing teams before all incident objectives have been met, and whenever major jurisdictional responsibilities are added or otherwise change within the incident.

Either at the time of the line officer's briefing for the incident management team, or at a separate place and time if necessary, ensure that the IMT has an opportunity to meet with, be briefed by, and thoroughly transition with, the current incident commander and the members of their organization prior to assuming command of the incident.

B. PURPOSE OF THE LINE OFFICER'S BRIEFING

The purpose of the line officer's briefing is to:

1. Provide a common understanding between the line officer and the incident management team of the environmental, social, political, economic, and other management issues relevant to the incident and its location.
2. Inform the IMT of the history, current status of the incident and actions taken to date, including weather, fire behavior, and effectiveness of tactics.
3. Present other documents providing intelligence and aids to management of the incident, including maps, photos, GIS products, weather forecasts, fire management plans, phone lists, agreements, operational period plans, and current ICS-209.
4. Present the wildland fire situation analysis with the selected alternative and the delegation of authority letter from the line officer to the incident commander.
5. Identify key agency personnel who will be involved with the IMT, including the line officer's representative, resource advisor, and incident business advisor.
6. Establish procedures and schedules for communication between the line officer and incident commander.

7. Establish how news media, public information, and important local and political contacts will be handled on the incident.
8. Establish resource ordering procedures.
9. Identify the IMT's responsibility for initial attack and support of other Forest incidents.
10. Establish the disposition of Forest suppression resources and local participation on the incident.
11. Establish understanding for the use of trainees on the incident.
12. Establish Forest and incident policy on compensable meal breaks, work/rest, rest and recuperation, and open vs. closed camps.
13. Establish standards for return of the incident to local management, including mop-up and fire suppression rehabilitation expectations.
14. Identify special safety awareness concerns and expectations.

C. CONDUCTING THE LINE OFFICER'S BRIEFING

The briefing should be planned for a comfortable setting away from most distractions, where the incoming incident management team and all required representatives of the host agency can assemble. It should take place as soon as the incoming team is assembled. It is essential that the line officer ensure notification of the briefing time and location to the incident commander, usually through the dispatch network.

The briefing should be led by the responsible line officer and follow an organized format to ensure information exchange and minimize the time required of the team prior to them mobilizing to the incident location. All agency participants must be prepared for their part in this procedure and all pertinent information and documentation must be printed in sufficient quantities for required distribution.

The agenda for the line officer's briefing should include:

- | | | |
|----|---|---|
| 1. | Welcome and Introductions | Line Officer / IC |
| 2. | Incident History | Unit Fire Supervisor/Area Fire Program Mgr. |
| 3. | Background of Other Activity or Issues on the Land Office or That May Influence This Incident | Line Officer/Area Fire Program Mgr. |

- | | | |
|----|--|---|
| 4. | Overview of WFSA Selected Native Strategy and Direction | Unit Fire Supervisor/Area Fire Program Mgr. |
| 5. | Presentation of the Line Officer's Briefing Package (Discussion of Each Element) | Unit Fire Supervisor/Area Fire Program Mgr. |
| 6. | Presentation of Delegation of Line Officer Authority to the IC | Line Officer |
| 7. | Emphasis on Safety | Line Officer |
| 8. | Questions and Answers | IC/Line Officer/Unit Fire Supervisor/Area Fire Program Mgr. |
| 9. | Concluding Remarks | Line Officer |

D. WHO SHOULD PARTICIPATE

1. **From the Forest**

- a. Line Officers (both the Unit Manager or Area Manager or their representatives)
- b. Unit Fire Supervisor/Area Fire Program Mgr.
- c. Resource Advisor
- d. Incident Business Advisor
- e. Current Incident Commander
- f. Dispatch Center Manager
- g. Incident Support Organization Coordinator
- h. Buying Team Leader
- i. Necessary Staff Specialists

2. **From the Incident Management Team**

- a. At a minimum, the Command and General Staff should attend. Attendance of other members of the teams should be at the IMT's discretion

3. **Others**

- a. Involved Cooperators' Representatives

Do not make the line officer's briefing a public meeting, and do not include the press.

E. LINE OFFICER'S BRIEFING FORMAT

The following is a format for organizing the line officer's briefing package.

LINE OFFICER'S BRIEFING
to
THE INCIDENT MANAGEMENT TEAM

_____ WILDLAND FIRE INCIDENT

_____ AGENCY

_____ ADMINISTRATIVE UNIT

_____ , _____

CONTENTS				
1.	Delegation of authority to the incident commander			
2.	WFSA _____	Fire ____	/ ____	/ ____
3.	Line officer's briefing form			
4.	ICS-209 for _	/ _	/ _	
5.	Unit fire management direction			
6.	Fire wx. forecast for _	/ _	/ _	
7.	Incident area map(s)			
8.	Incident area aerial photo(s); (planning section chief packet only)			
9.	Resource, overhead, and equipment order forms completed to _		/ _	/ _
	(logistics section chief packet only)			
10	Agency, incident telephone directory copies to (21):			
	Command and General Staff:			
	<input type="checkbox"/> IC			
	<input type="checkbox"/> Deputy IC			
	<input type="checkbox"/> Planning Section Chief			
	<input type="checkbox"/> Operations Section Chief			
	<input type="checkbox"/> Finance Section Chief			
	<input type="checkbox"/> Logistics Section Chief			
	<input type="checkbox"/> Incident Information Officer			
	<input type="checkbox"/> Safety Officer			
	<input type="checkbox"/> Liaison Officer			
	<input type="checkbox"/> Air Operations Director			
	<input type="checkbox"/> Area Commander (if ACA established)			
	<input type="checkbox"/> MAC Group Coordinator (if MAC established)			
	<input type="checkbox"/> Other			
	Local Organization:			
	<input type="checkbox"/> Supervisor/Manager/Superintendent			
	<input type="checkbox"/> Incident Business Advisor			
	<input type="checkbox"/> District Ranger/RA Manager			
	<input type="checkbox"/> Resource Advisor			
	<input type="checkbox"/> Agency Fire Staff			
	<input type="checkbox"/> Unit FMO			
	<input type="checkbox"/> Agency Dispatch Center Manager			
	<input type="checkbox"/> Incident Support Coordinator (if ISO established)			
	<input type="checkbox"/> Public Affairs Officer			

KEY PERSONNEL AND CONTACTS FOR THE (name of wildland fire) INCIDENT

For the _____ Land Office:

For Other Agency Cooperators:

For _____ County:

Local Landowners, Residents, Permittees, Parties with Interest:

LINE OFFICER'S BRIEFING TO THE INCIDENT MANAGEMENT TEAM

A. INCIDENT IDENTIFICATION

1. Name of Incident: _____
2. Incident Start:
Cause _____
Date _____
Time _____
3. Size of Incident: _____
4. Current IC: _____
5. General Weather Conditions/Forecast:

6. Fire Behavior:

7. Fuel Types:
At Fire _____
Ahead of Fire _____

B. COMMAND CONSIDERATIONS

1. Other Fires on Unit/Cooperators:

2. Delegation of Authority; Line Officer's Representative:

3. Resource Advisor(s) Assigned to Incident:

4. Technical Specialists Assigned to Incident:

5. Land Mgmt. Plan / Fire Mgmt. Plan direction:

6. Priority for This Incident (Local, Area, State):

7. Values to be Protected:

8. Political Considerations:

9. Social/Economic Considerations:

10. Health and Welfare Considerations:

11. Human Resources Management Considerations:

12. Desired Local Participation in Fire Team Organization:

13. Unified Command (In Place or Contemplated):

14. Area Command (In Place or Contemplated):

15. MAC Organization (In Place or Contemplated):

16. Evaluation Team Assigned:

17. News Media Relations:

18. IIO Organization Report to:

19. Special Relationships/"Thank You" Policy for Assistance:

20. Other Agencies on This Incident:

21. Land Status:

22. Cooperative Agreements Relevant to Incident:

23. Condition of Organization on Rest of Unit:

24. Capability of Unit to Support Team:

25. Training Opportunities/Policy on Use of Trainees:

26. Team will assume command: Date _____ Time _____
27. Transition and Close-out Plan:

C. SAFETY CONSIDERATIONS

1. Accidents/Near Misses on Incident to Date:

2. Status of Accident Investigations/Reports:

3. Areas with Known or Potential Hazards:

4. Firefighter Safety Considerations:

5. Public Safety Considerations:

6. Critical Incident Stress Management Procedures:

7. Medical Treatment Facilities/Procedures:

D. OPERATIONS CONSIDERATIONS

1. Priorities for Management, WFSA-Selected Strategy:

2. Are Structures Threatened?

3. Equipment on Fire:

Is all equipment inspected and signed up?

4. Tactics Used to Date and Success:

5. Fire Weather Forecasting Services/Fire Weather Station(s) Data Availability:

6. Mop-up Standards:

7. Initial Attack Responsibilities:

8. Airtankers Assigned:

Airtanker Effectiveness:

9. Air Base Location:
Telephone: _____
10. Helicopters Assigned: _____
11. Helibase location:
Telephone: _____
12. Crash/Rescue at Helibase: _____
13. Temporary Flight Restriction assigned: _____
14. Flight Hazard Map Available/Known Hazards in Area: _____
15. Smoke Conditions Affecting Air Operations: _____
16. Air Operations Technical Specialist Assigned or Ordered: _____

E. PLANNING CONSIDERATIONS

1. Unusual Fire Behavior and Fire History in Area of Fire: _____
2. Legal Considerations (Investigations in Process): _____
3. Pre-attack Plans Available: Yes _____ No _____
4. Availability of Aerial Photos and Maps: _____

5. Agency Needs for Release of Presently Assigned Resources:

6. Incident Status Summary (ICS-209) Reporting Requirements:

7. Most Recent ICS-209 Available:

8. Training Specialist Assigned or Ordered:

9. Personnel Now on Incident (Organization):

10. Firefighter Rest and Rehabilitation Policy:

11. Fire Suppression Rehabilitation Policy:

12. Demobilization Procedures:

F. LOGISTICS CONSIDERATIONS

1. ICP Location:

2. Base Location:

3. Incident Transportation Plan:

4. Incident Support Organization:

5. Ordering System To Be Used:

6. Procurement Unit/Buying Team in Place or Ordered:

7. Security Considerations/Local Law Enforcement Assistance:

8. Communications System(s) in Use/Ordered:

9. Resources Ordered:

10. Catering Services/Feeding Procedures:

11. Medical/Burn Facilities:

12. Medivac Procedures:

13. Potable Water Sources:

14. Gray Water Disposal Location:

15. Garbage Disposal Service/Location:

16. Incident Recycling Requirements:

G. FINANCE CONSIDERATIONS

1. Fiscal Considerations/Limitations or Constraints:

2. Cost to Date:

3. Cost-Sharing Agreements in Effect:

4. Incident Business Management Advisor Assigned:

5. Procedure established for T&A transmittals:

6. Claims to Date:

7. Potential for Claims:

ANNEX C

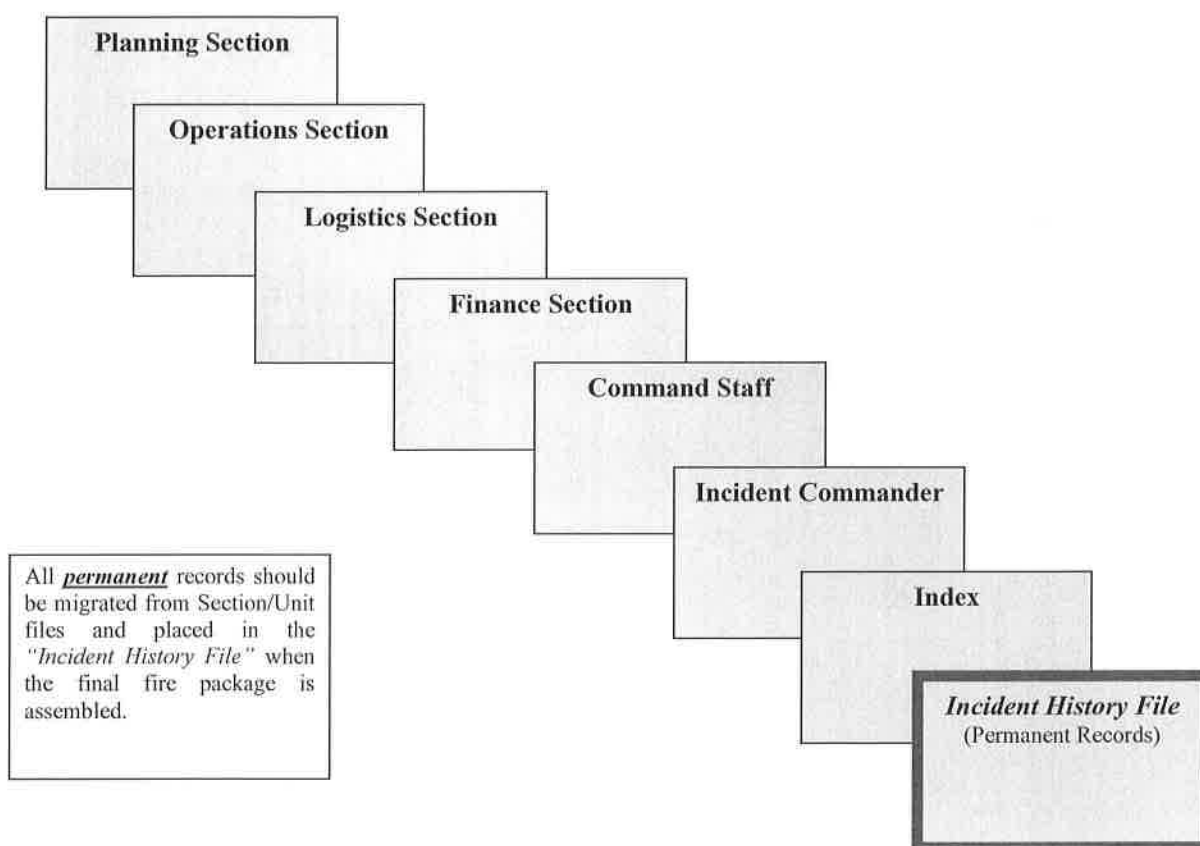
DOCUMENTATION PACKAGE FOR LARGE FIRE INCIDENTS

A quality fire package standard should be conveyed to IMTs at in-briefings and be included in Delegations of Authority. Establish transfer requirements for fire package contents from IMT to IMT on long duration incidents. This is especially important when fires are transferred from one complex to another. All line officer training should teach a standard level of documentation. Incidents of long duration should have one individual assigned to documentation by the hosting agency(ies) who will stay for the duration of the incident. Line Officers should review fire packages well before closeout meetings to ensure the packages meet their quality and documentation expectations. If the package is deficient, keep the team assigned until it meets expectations of a quality fire package.

Incident Records Management information can be found at: <http://www.nifc.gov/records>.

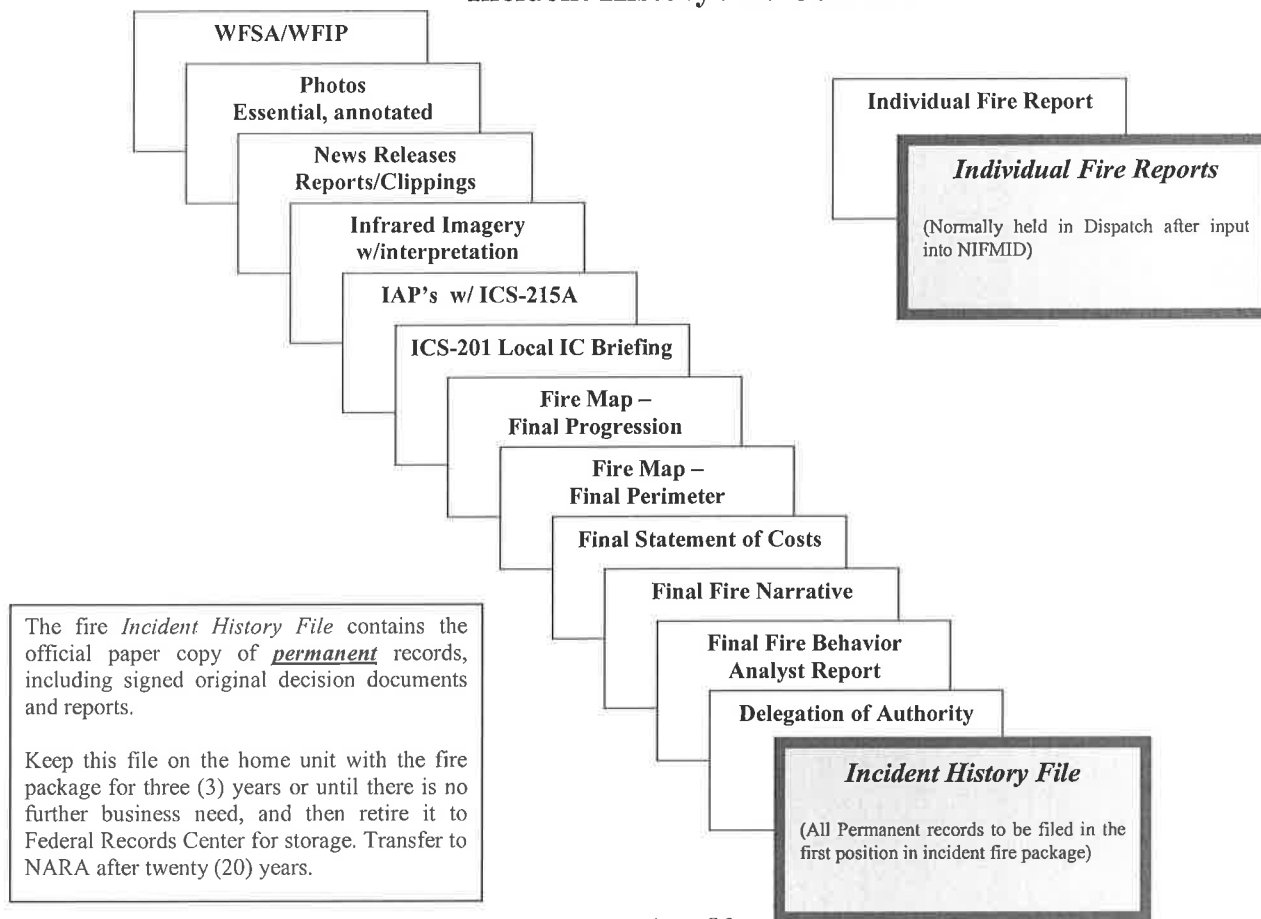
Following is an outline of documentation that could be included in a large fire incident fire package.

Wildland Fire Incident Records **Paper Document File Directory**



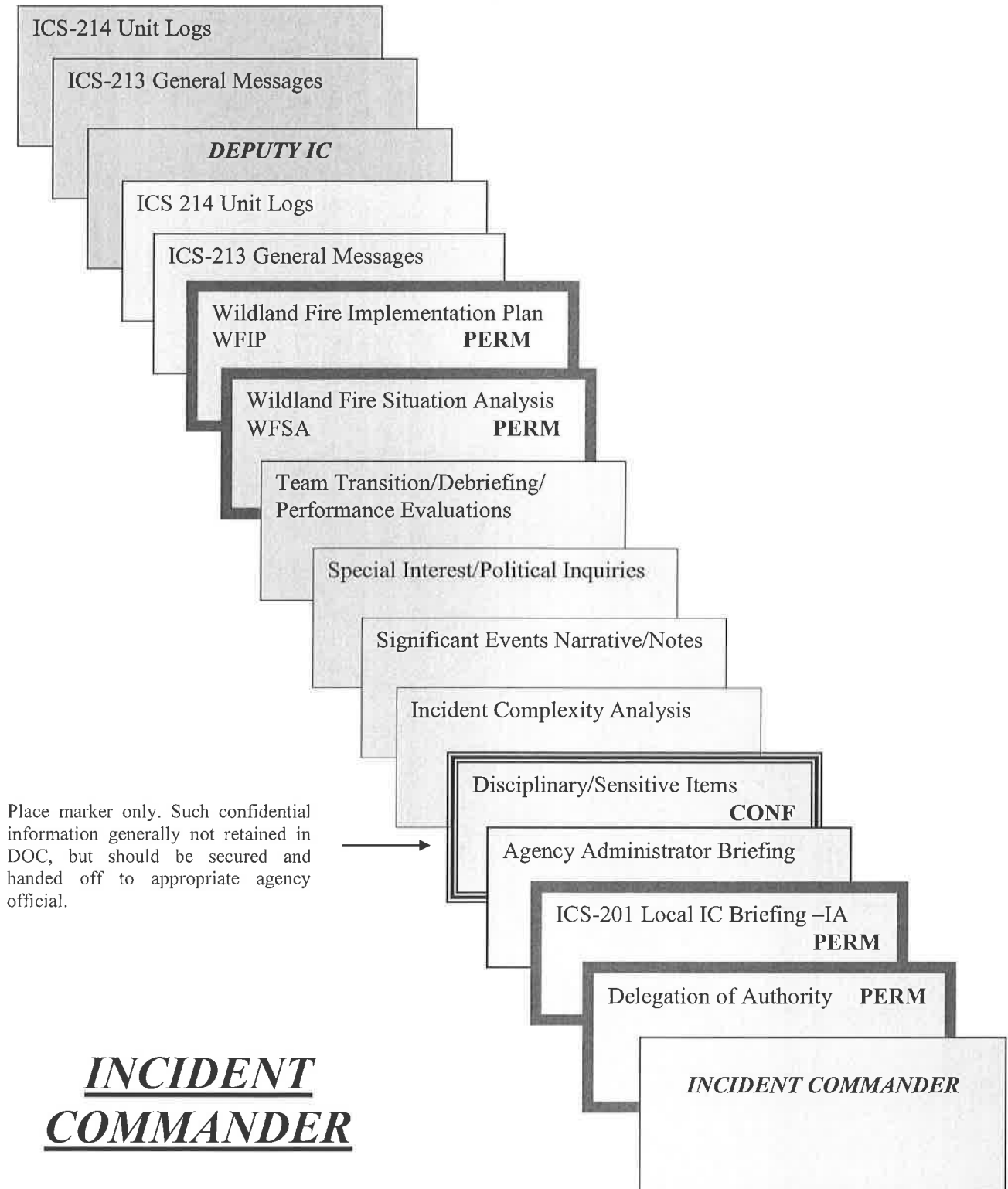
Wildland Fire Incident Records

Incident History File Contents



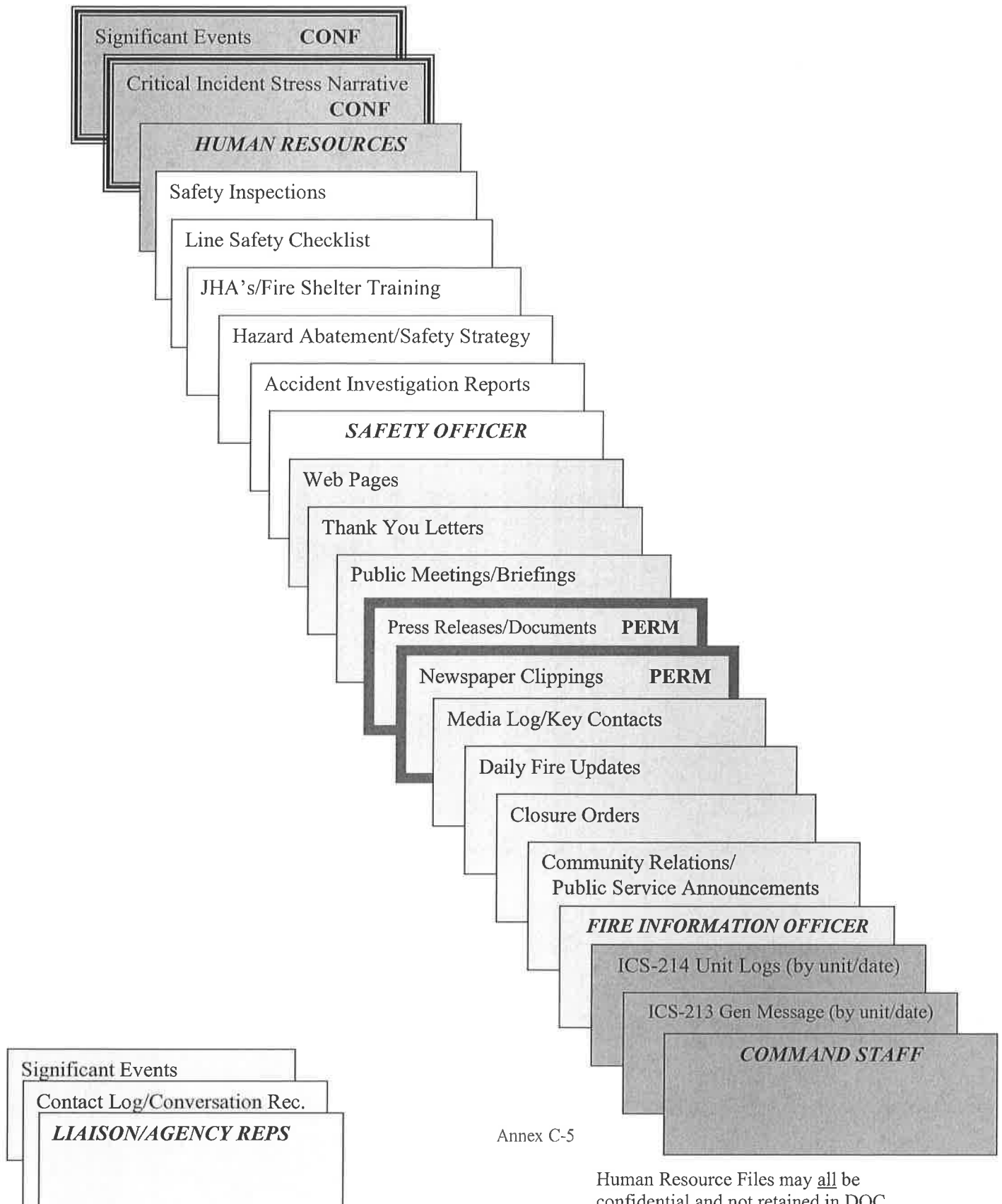
Wildland Fire Incident Records

Paper Document Files



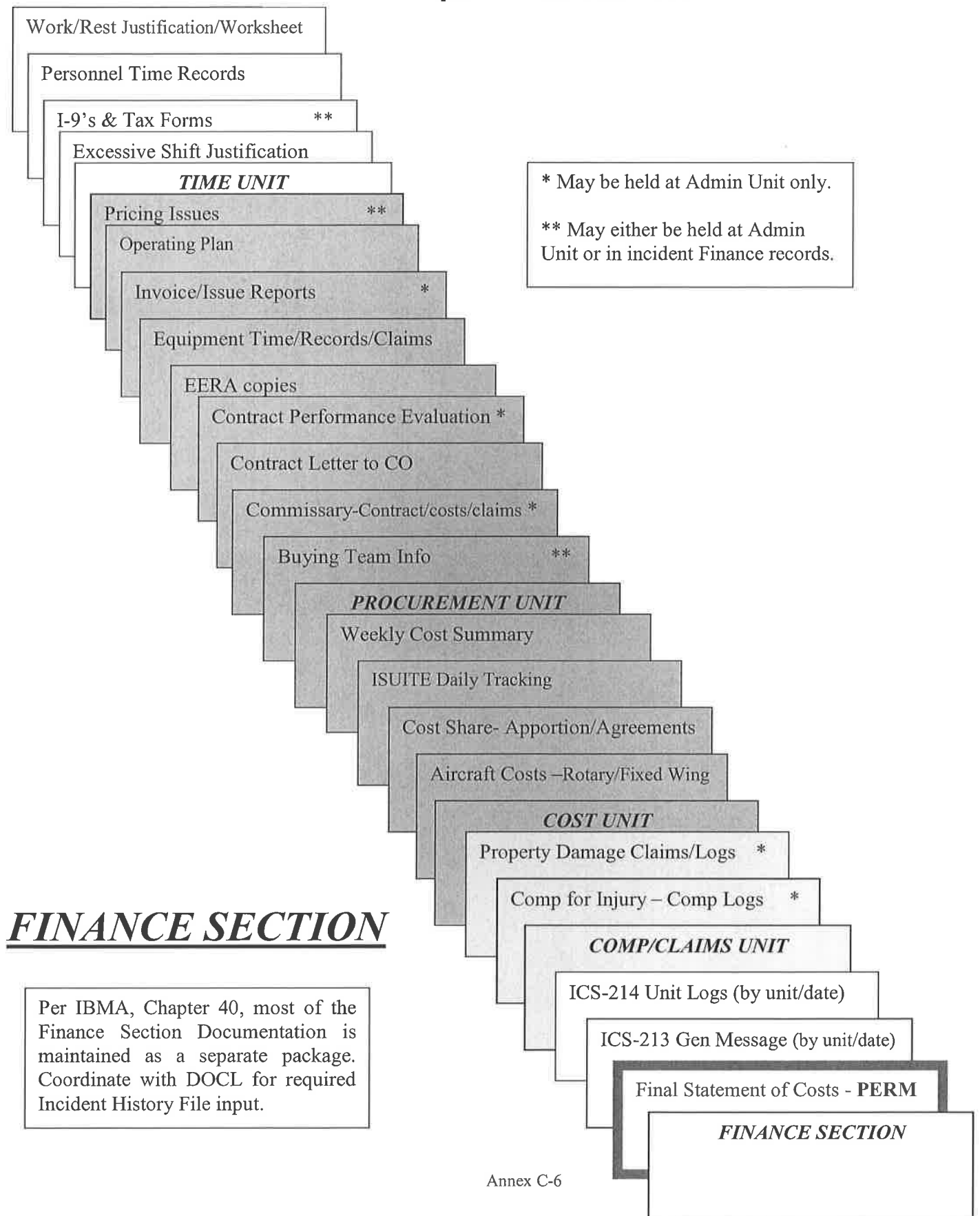
Wildland Fire Incident Records

Paper Document Files



Wildland Fire Incident Records

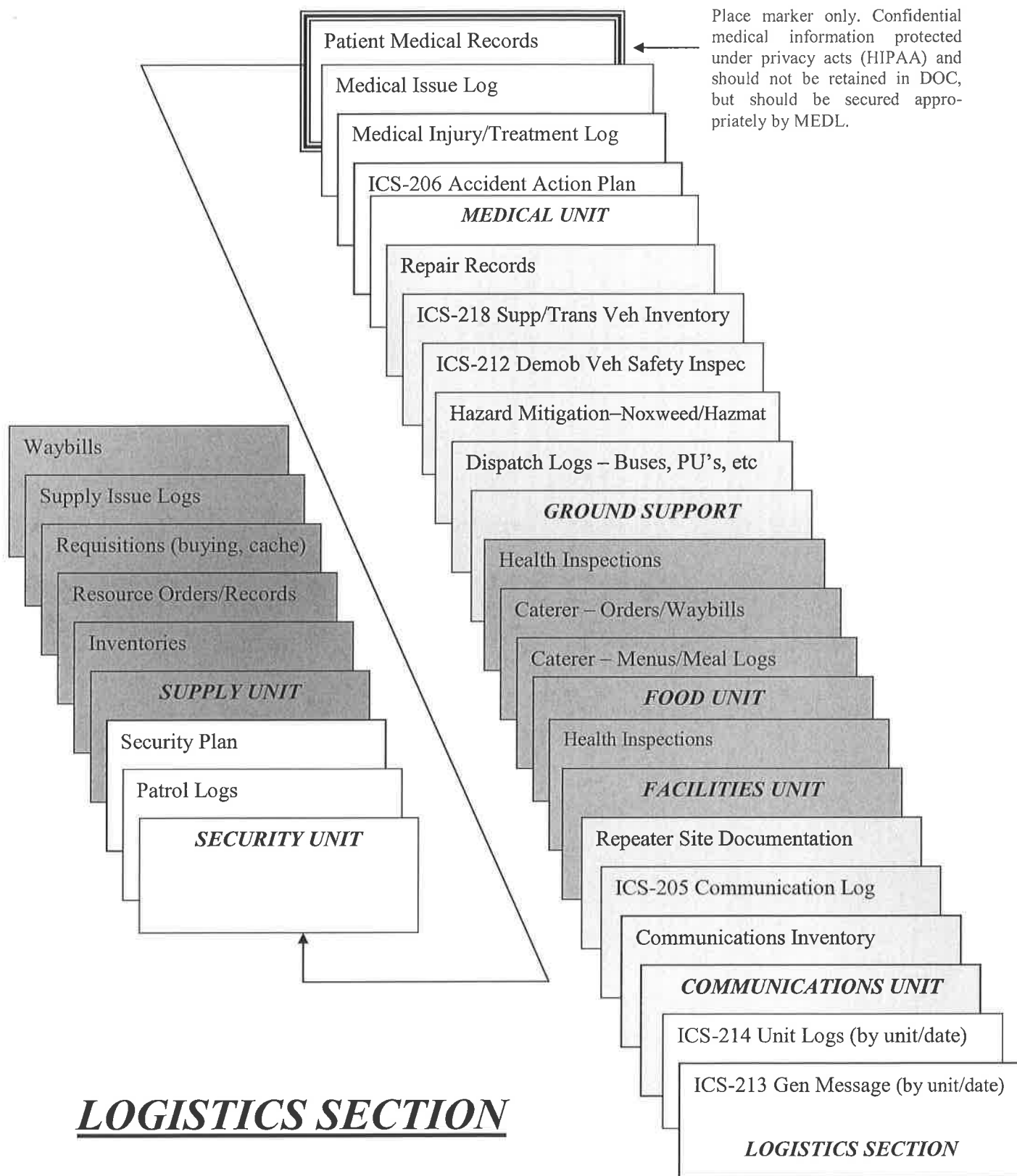
Paper Document Files



Wildland Fire Incident Records

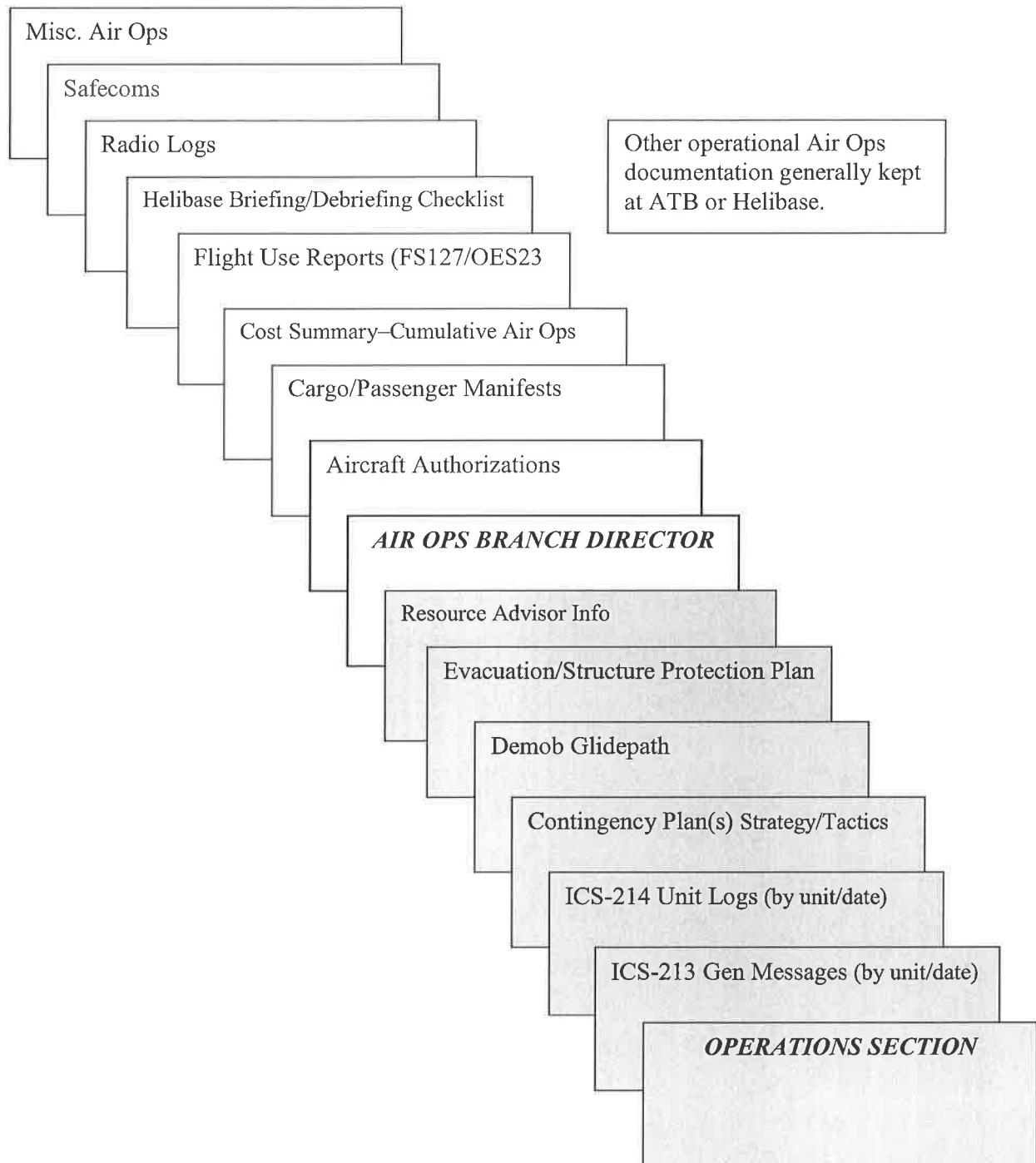
Paper Document Files

Place marker only. Confidential medical information protected under privacy acts (HIPAA) and should not be retained in DOC, but should be secured appropriately by MEDL.



Wildland Fire Incident Records

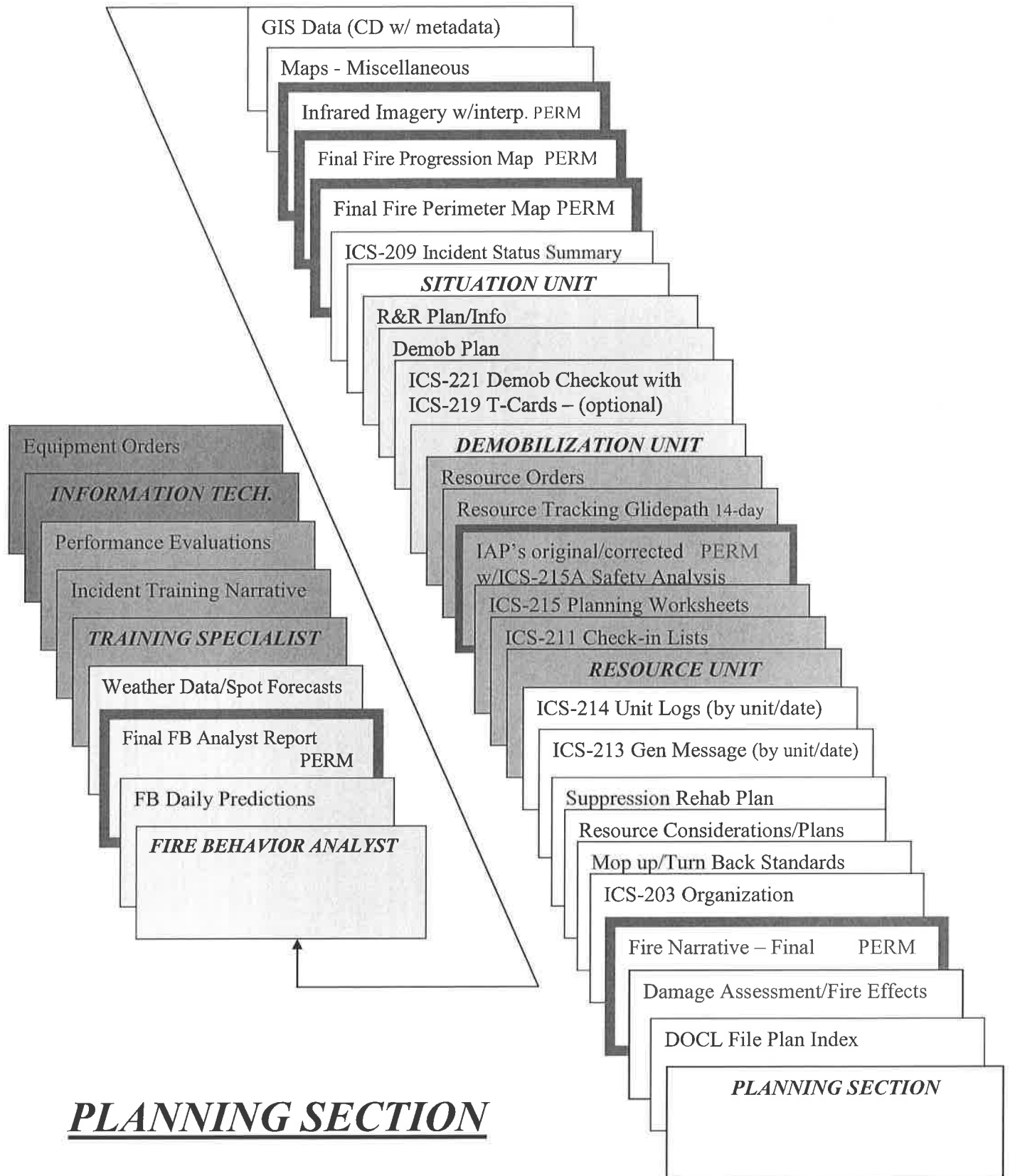
Paper Document Files



OPERATIONS SECTION

Wildland Fire Incident Records

Paper Document Files



ANNEX D

DOCUMENTATION OF LENGTH OF ASSIGNMENT EXTENSION REQUIREMENTS

Documentation of any type of assignment extension should include the following:

- I. **Name and Position/Type of Resource**
- II. **Length of Extension**
- III. **Rationale for Extension (Mark All That Apply)**

- A. Life and property threatened.
- B. Suppression objectives are close to being met.
- C. Replacement resources are not available (unable to fill).
- D. Military assignment.
- E. Other:

- IV. A. **Single Resource Recommendation**

Resource Name, Title and Signature: _____

Section Chief Name, Title and Signature: _____

OR

- B. **Incident Management Team/Area Command Recommendation**

Operations Section Chief: _____

Planning Section Chief: _____

Finance Section Chief: _____

Logistics Section Chief: _____

- V. **APPROVAL**

Incident/Area Commander Signature

Date

ANNEX E

INDUSTRIAL HEAD PROTECTION USER INFORMATION GUIDE

Hard Hats: Maintenance, Inspection, and Precautions

The hard hat is one of the most important pieces of equipment worn in the industrial workplace. Many workers have been saved from serious injury or even death because they were wearing a hard hat. To assist in your organization's head protection program, E.D. Bullard Company would like to share some observations on proper maintenance and inspection of industrial hard hats, as well as a few precautions. These comments apply to hard hats made by all manufacturers, not just Bullard.

A conventional hard hat consists of two components--the shell and the suspension--which work together as a system. Both components require periodic inspection and maintenance. It is recommended that employers conduct a regular head protection inspection, maintenance, and replacement program. Each program will vary according to the work environment at each job site location.

Hard Hat Shell

Thermoplastics (polyethylene, polycarbonate, and polyphthalate carbonate [P.P.C.][Lexan]) and thermoset materials (fiberglass and phenoli-impregnated textiles) are commonly used to mold the shells of industrial hard hats. These materials have proven to be durable, reliable, lightweight, and provide effective protection. Given proper care and normal workplace conditions, a hard hat will have a reasonable service life.

The shell should be inspected routinely for dents, cracks, nicks, gouges, and any damage due to impact, penetration, abrasions, rough treatment, or wear that might reduce the degree of protection originally provided. Any hard hat that shows signs of worn or damaged parts should be removed from service immediately and replaced.

Although Bullard adds an ultraviolet inhibitor to hard hat shells, all hard hats are susceptible to damage from ultraviolet light, temperature extremes, and chemical degradation. Thus, users who work in environments with high degrees of exposure to sunlight, heat, cold, or chemicals should replace their hard hats more frequently than workers in other environments.

Degradation of thermoplastic material may be apparent when the shell becomes stiff, brittle, faded, dull in color, or exhibits a chalky appearance. With further degradation the shell surface may craze, flake, or delaminate. A hard hat should be replaced immediately at the first sign of any of these conditions.

The following is a simple field test that can be performed by an employee or supervisor to determine possible degradation of polyethylene shells:

Compress the shell inward from the sides about 1" with both hands and then release the pressure without dropping the shell. The shell should quickly return to its original shape, exhibiting a degree of elasticity. Compare the elasticity of the sample with that of a new

shell. If the sample does not exhibit a similar degree of elasticity to that of a new shell or if it cracks due to embrittlement, it should be replaced immediately.

Hard Hat Suspension

The hard hat suspension system is just as important as the shell. Its main purpose is to help absorb the shock of a blow. Therefore, it must be in good condition at all times.

Like the shell, the suspension must also be inspected and replaced periodically. Over a period of time, the suspension will become worn and may become damaged.

Suspensions should be inspected closely for cracks, frayed or cut shell straps, torn headband or size adjustment slots, loss of pliability, or other signs of wear. These conditions can be caused by perspiration, hair oils, or normal wear.

Any suspension that is damaged must be removed from service and replaced immediately.

Cleaning

Hard hat service life can be extended by cleaning both the shell and the suspension. This should be part of the inspection and maintenance program. Scrub the shell and suspension with a mild detergent to remove dirt and stains. Rinse thoroughly with clean, warm water approximately 60 degrees Celsius (140 degrees Fahrenheit). After rinsing, wipe dry and carefully inspect once again for any signs of damage.

What is the Useful Life of a Hard Hat?

Users of industrial head protection devices must realize that these products do not have an indefinite useful life. E.D. Bullard Company recommends that employers conduct a regular head protection replacement program as a responsive solution to the task of addressing useful service life of hard hats.

Since the details of such a program must be developed based on work conditions at each job site, it is impossible to provide a specific timeframe for hard hat replacement. As a general guideline, many large corporations replace all employees' hard hats every five years, regardless of the hard hats' outward appearance.

Where user environments are known to include higher exposure to temperature extremes, sunlight or chemicals, hard hats should be replaced automatically after two years' use. This is based on information and hard hat samples returned to E.D. Bullard after being exposed to such conditions. It may be that in certain rare instances a hard hat should be replaced within less than two years.

The employer should have a policy of immediately replacing a hard hat if the employee (wearer) feels it is necessary.

WARNING: In addition to an inspection and maintenance program, employers should review with their employees some precautions concerning hard hat use and treatment. The following are some warnings that should be discussed:

- X If the hard hat has been struck by a forcible blow of any magnitude, both the hard hat shell and suspension should be replaced immediately, even if no damage is visible.
- X A conventional hard hat provides limited protection by reducing the force of falling objects striking the top of the shell. Protection from side impact and penetration is limited.
- X The hard hat shell or suspension should never be altered or modified. Drilling holes in the shell for ventilation purposes must be prohibited at all times.
- X Avoid contact of the hard hat with electrical wires.
- X Hard hats should not be carried on the rear window shelf of an automobile or stored in direct sunlight. Exposure to extreme sunlight over time may cause degradation which can affect the degree of protection originally provided.
- X Because hard hats can be damaged, they should not be abused. They should be kept free of abrasions, scrapes, and nicks and should not be dropped, thrown, or used as supports. Do not sit on a hard hat.
- X Wearers should never carry or wear anything inside their hard hat. A clearance must be maintained between the shell and head for the protection system to work properly.
- X Do not paint a hard hat prior to consultation with the manufacturer. Some paints and solvents may attack and damage the shell and reduce the degree of protection originally provided.
- X As a general guideline, all new employees should be provided with a new, unused, and unexposed hard hat. The practice of reissuing cleaned hard hats must be avoided. The cost of a hard hat is negligible when the potential for injury, lost time, health care cost, and liability are considered.

**AMERICAN NATIONAL STANDARD FOR PERSONNEL PROTECTION
PROTECTIVE HEADWEAR FOR INDUSTRIAL WORKERS--REQUIREMENTS
ANSI Z89.1**

Recommendations and Precautions Concerning Helmet Use, Maintenance, and Testing

B1. Laces

Laces, if any, should always be tied securely with a square knot.

B2. Cleaning

Shells should be scrubbed with a mild detergent and rinsed in clear water approximately 60 degrees Celsius (140 degrees Fahrenheit). After rinsing, the shell should be carefully inspected for any signs of damage.

Removal of tar, paints, oils, and other materials may require the use of a solvent. Since solvents may attack and damage the shell, the manufacturer should be consulted with regard to an acceptable solvent.

B3. Painting

Caution should be exercised if shells are to be painted, since some paints and thinners may attack and damage the shell and reduce protection. The manufacturer should be consulted with regard to paints or cleaning materials.

B4. Periodic Inspection

All components, shells, suspensions, headbands, sweat bands, and accessories, if any, should be visually inspected daily for signs of dents, cracks, penetration, and any damage due to impact, rough treatment, or wear that might reduce the degree of safety originally provided. Any industrial helmet that requires replacement or the replacement of any worn, damaged, or defective part should be removed from service until the condition of wear or damage has been corrected.

B5. Limitation of Protection

Industrial protective helmets meeting the requirements of ANSI Z89.1 are designed to provide optimum protection under average conditions. Users are cautioned that if unusual conditions prevail (for example, higher or lower extremes of temperature than those prescribed), or if there are signs of abuse or mutilation of the helmet or of any component, the margin of safety may be reduced.

Note: All items constructed of polymeric materials are susceptible to damage from ultraviolet light and chemical degradation, and safety helmets are no exception. Periodic examination should be made of all safety helmets and in particular those worn or stored in areas exposed to sunlight for long periods. Ultraviolet degradation will first manifest itself in a loss of surface gloss, called chalking. Upon further degradation the surface will craze or flake away, or both. At the first appearance of either or both of the latter two phenomena, the shell should be replaced immediately for maximum safety.

B6. Sizes

Provisions should be made by the manufacturer of industrial protective helmets for testing large and small sizes as appropriate.

B7. Precautions

Because helmets can be damaged, they should not be abused. They should be kept free from abrasions, scrapes, and nicks and should not be dropped, thrown, or used as supports. This applies especially to helmets that are intended to afford protection against electrical hazards.

Industrial protective helmets should not be stored or carried on the rear-window shelf of an automobile, since sunlight and extreme heat may cause degradation that will adversely affect the degree of protection they provide. Also, in the case of an emergency stop or accident, the helmet might become a hazardous missile.

The addition of accessories to the helmet may adversely affect the original degree of protection. When precautions or limitations are indicated by the manufacturer, they should be transmitted to the wearer and care taken to see that such precautions and limitations are strictly observed.

B8. Safe Condition

Neither the impact resistance requirements (see 7.2) nor the electrical insulation requirement (see 7.1) should be construed to indicate the safe impact level or safe voltage to which the industrial worker may be subjected. The maximum voltage against which insulating safety headgear will protect the wearer depends on a number of variable factors, such as the characteristics of the electrical circuit and the equipment involved, the care exercised in maintenance of equipment, and weather conditions. Therefore, the safe and proper local use of insulating safety headgear is beyond the scope of ANSI Z89.1.

ANNEX F

Suppression Considerations in Meeting Operational Objectives

Table

While meeting DNRC suppression objectives for fires escaping initial attack, firefighters should be Mindful of the following during all operational activities.

“When opportunities are present during suppression operations give consideration to the following”.

Resource or Activity	CONSIDER	ATTEMPT TO AVOID
Strategy / Planning	At in-briefing, meet with Line Officer and clearly identify fire progression points at which you will get back together and review goals and objectives.	Keeping original control goals and objectives long after the fire behavior and size has changed.
Base and spike camps	Asking the local Unit/Area Office or their assigned representative if weed free base and spike camp locations have been identified, or need to be identified.	Set up of base and spike camps without asking the local Unit/Area Office on weed status for the site you are considering.
Line Construction	Building only line you feel confident you can hold and safely patrol.	Contingency line construction without specific approval of the Line Officer.
	Mapping all line by location (including ones not used) and type as you build it – report and provide line map at end of every shift to Plans unit.	Building line without mapping it or assume someone else will find and repair it.
	Selecting the appropriate equipment for the job. Use in the following priority: <ol style="list-style-type: none"> 1. Natural barriers 2. Handline or FLE 3. Excavator 4. Skidgers 5. Feller Bunchers/Clippers 6. Dozers 7. Logging is last choice 	Determination of line construction type solely on excess equipment that might have been ordered or is available.
	Building fireline out of riparian areas and at least 50 feet from stream channels. Consult Agency Rep as needed.	Avoid building mechanical fireline down a stream bed, defined draw or in a riparian area.
	Minimizing disturbance to riparian vegetation, large woody debris and riparian filters.	<ol style="list-style-type: none"> 1. Cutting riparian vegetation unless it is scouted and perpendicular to the stream channel. 2. Clean-out of Large Woody Debris from streams or cut riparian logs into short rounds.

Resource or Activity	CONSIDER	ATTEMPT TO AVOID
	Minimizing width of fuel breaks and constructed line. Base width upon current and predicted fire behavior.	Constructing wide lines as fuels decrease or the line is crossing natural barriers.
Use of Dozers	Asking yourself how “you” are going to repair the line to pre-fire condition as it is being built	Building dozer/cat line thinking it will be someone else’s job to repair the line.
	Scout all mechanical equipment line locations prior to line construction.	Letting operators build line without specific direction from the dozer boss.
	Scouting and selecting dozer creek crossings where there are gentle and/or hardened banks. Always lift blade when crossing. If crossing location is soft, lay 6-8”dia trees in the stream and drive (walk) equipment across them.	Allowing a dozer to run up or down a creek channel or cross a channel with very soft banks.
	When building mechanical (dozer or excavator) line make every attempt to assign crews to hold and patrol it.	Building mechanical line and leave unpatrolled when the fire is nearby.
	If possible, Blading soil and seed from weed infestations TOWARD a road that cat line is anchoring to or an already infested area when feasible.	Blading soil and seed from weed infestations into uninfested areas.
	Minimizing damage to structures, fences, reference posts, and other structural improvements. If it is not possible to avoid fences, attempt to cut the wire, and not tear down with equipment.	Fences and other structural improvements during line construction.
	Handling, storing and dispensing fuel, lubricants and other chemicals at least 50 feet from a drainage way <ul style="list-style-type: none"> • Use approved containers for fuel, lubricant and chemicals • Properly store and discard all empty containers. 	1. Refueling on a bridge or within 50 feet of a drainage way. 2. Leaving any hazardous materials on-site after the incident.
Water/Diversions/Pumps	Diverting water from creeks at low rates and developing storage. Ask Unit Office for possible drafting site locations and map.	Diverting water at high rates and dewatering that can significantly reduce instream flow, and complete draw down of a water dip source.

Resource or Activity	CONSIDER	ATTEMPT TO AVOID
	Having spill kits, extra containment pads and tarps with all pumps.	The use of pumps or storage of fuel next to a creek without containment pads.
	Storing fuel and oils on containment pads away from the water's edge.	Refueling pumps right next to or over live water.
	Recording locations of aerial water dip sites used.	
Retardant	Maintain a buffer when flying retardant parallel to a drainage way, avoid when possible.	Dropping retardant over water or riparian areas.
	Mixing and loading retardant at least 300ft. from streams and riparian areas.	Mixing or loading retardant within 300ft. of streams and riparian areas.
Potential Low Impact Practices	Building only the necessary line needed, and consider how you will rehab the line to pre-fire condition as you build it.	Building fire line thinking it will be someone else's job to repair it.
	Packing out all your litter and any other litter you find at all times.	Dropping litter, leaving litter you find, or assuming someone else will pick it up later.
	Using cold-trail, wet line or a combination when appropriate.	Building line when the fire is out.
	Minimizing the fireline standard where firelines connect with roads especially on Private ground.	Building high standard line into roads because they may develop into non-system roads or ATV trails after the fire.
	Minimizing bucking and cutting of trees and the number of cut surfaces and resulting "rounds" or logs.	Cutting down or felled logs into lots of short sections.
Helispots	Checking potential helibases and helispots for noxious weeds BEFORE using the site – if possible use only weed free sites or mitigate prior to use.	Use of weed infested sites for helibases, helispots, staging, parking, landing, cargo loading or loafing areas.
	Asking the local Unit/Area Office if weed free helibases and helispots have been identified.	Set up of a helibase or helispots without asking the local Unit/Area Office the weed status on the site you are considering.
	Minimizing weed spread at helibases by incorporating weed prevention and containment practices such as mowing, flagging or fencing weed patches, designating weed-free travel routes.	Establishing or use of a weed-infested area for a helibase, helispot or landing zone.

Resource or Activity	CONSIDER	ATTEMPT TO AVOID
	Providing weed prevention briefings for helibase staff.	The assumption that helibase staff will know weed prevention practices or local noxious weed species.
	Inspecting, and if necessary cleaning, contract fuel and support vehicles before and after each incident when travelling off road or through weed infestations.	Allowing helibase vehicles to drive through or park in weed infested areas.
	Inspecting and removing weed seed and plant parts from all cargo nets.	Loading nets or cargo in weed infested areas.
	Avoiding helispot locations that are wet or may have sensitive vegetation.	Creating openings that are larger than needed to safely accomplish the objective.
	Flight paths into and out of helispots to avoid flying over live water and riparian areas.	Landing aircraft in or near riparian areas.
Weed Prevention Practices	Discussing the weed situation with the Unit Rep at initial briefing.	Beginning without discussing weeds with local Agency Rep.
	Setting up a weed washing station for all ground transportation no later than two shifts after commencing with ground disturbing activities.	Operating past the first two shifts if a weed washing station has not been set up.
	Posting; weed identification and prevention posters at readily visible locations around camp.	Not educating all fire personnel on the incident of weed issues and concerns.
	Blading soil and seed from weed infestations <i>TOWARD</i> a road that cat line is anchoring to or an already infested area when feasible.	Blade soil and seed from weed infestations into uninfested areas.
	Inspecting all fire going vehicles regularly to assure that undercarriages and grill works are kept weed seed free. All vehicles sent off Unit for fire assistance should be cleaned before they leave or return to their home.	Demobing vehicles until they have had an undercarriage wash.
	Minimizing weed spread in camps by incorporating weed prevention and containment practices such as: mowing, flagging or fencing weed patches, designating weed-free travel routes and washing equipment.	Establishing camps in weed infested areas.

Resource or Activity	GIVE CONSIDERATION TO	ATTEMPT TO AVOID
Snags	Minimizing snag felling.	Felling snags that are not a safety hazard or will have no benefit to suppression efforts
	Leaving snags standing that are a potential hazard <i>but not</i> close to the line or posing a safety risk	Felling snags that are well beyond designated mop-up distances
	Avoiding snagging in riparian areas but if you have to, directionally fall snags towards the channel with no more than 50% of the tree length within the active channel.	Cutting felled snags into small rounds when in riparian areas.
Revegetation	Using DNRC/Local direction for Seed Mixes and current seeding guidelines, this will be included in the Suppression Repair Plan.	Using species substitutions without consulting the Agency Rep.
	Consider using only Blue Tag/weed free seed only.	Use of any seed of unknown origin and is not certified and tagged weed seed free.
	Using only certified weed-free or weed-seed-free straw used for erosion control.	Using straw of unknown origin or that is weed infested.
	Using mechanical/aerial seeding of dozer line and mechanically cleared areas when appropriate.	The assumption that later rehabilitation efforts will do revegetation of suppression activities.
	Retaining enough crews or the proper equipment to accomplish revegetation needs.	Under estimating the revegetation needs under suppression rehab.

ANNEX G

EXAMPLE

FIRE SUPPRESSION REPAIR PLAN TEMPLATE

Montana Department of Natural Resources and Conservation

This template is designed to give a general outline of what is required to be prepared for a visiting IMT and/or documentation purposes of local repair efforts. Use what is necessary within this template to prepare your fire suppression repair plan.

PREPARED BY:

(Name)
(Agency)

Date
(Title)

Fire Suppression Repair Team Members Contributing to this plan include: (if more than one)

APPROVED BY:

(Incident Commander)

Date

(Name)
(Unit Manager/Area Manager)

Date

3. **Water Quality and Watershed Values** – Minimize sediment delivery into streams and/or drainages to maintain water quality.
4. **Cultural Resources** – Protect any cultural resource sites that were impacted and repair areas where fire suppression activities destabilized slopes near sites.
5. **Travel Management** – Restrict unintended/undesired motorized vehicle access that may have been created by the construction of dozer lines. Provide for reestablishment of pre-incident road closures and reestablish administratively desired roadway widths/conditions to pre-disturbance widths/conditions.
6. **Cleanup** – Remove suppression related equipment, (debris, trash, signing, flagging) at facilities used by suppression personnel.
7. **Facilities** – Restore access roads, camps, equipment staging areas, helibases, helispots, retardant plants, and other sites to original pre-fire condition.
8. **Resource Recovery** – Stage (deck) commercial materials generated during fireline construction for salvage by respective land owners.
9. **Private Land Values** – Provide consistent fire suppression repair treatments that are responsive to various land owner needs.
10. **Cost Containment** – Ensure that treatments are feasible and costs are considered while developing and implementing fire suppression repair treatments.

GUIDELINES:

Specific sites in need of repair will be categorized by geographic area and identified by geographic area and/or Branch or Division where applicable. A **Repair Operations Guide** may be developed and coordinated with the Incident Management Team (IMT) to ensure timely repair. The Resource Advisor or designee will provide the IMT with recommended amendments to this plan for Incident Action Plan preparation. The following general guidelines will be followed during all repair activities:

1. Agency Resource Advisor(s) will be available to work with fireline personnel during implementation of suppression repair.
2. Assessments will be ongoing, based on operations and events as they occur within the ____ fire perimeter. Additional sites that are discovered in the field should be subsequently mapped and repaired.
3. Motorized equipment used for repair will be thoroughly cleaned of any plant materials that could potentially contain noxious weed seeds prior to entering planned repair work areas. In addition, all vehicles involved in the fire incident will be re-cleaned prior to demobilization from the incident to reduce the risk of transporting noxious weed seed to other areas. Vehicle washing logs will be completed to document compliance if so requested.

- Block off motorized access. Where available, use boulders and large woody debris.
- Remove all trash, equipment, and flagging.

Hand Lines:

- Reposition litter and organics, top soil, and large woody debris onto disturbed areas. Scatter additional unused material to eliminate berms and debris piles along the fireline. Eliminate evidence of the line as much as practical.
- Construct water bars (insert specifications below).
- Block off motorized access. Where available, use boulders and large woody debris.
- Remove all trash, equipment, and flagging.

Pumping and Drafting Sites:

- Restore all water sources that were used to supply hose lays, tenders, and engines during the suppression efforts to their pre-fire condition.
- Restore natural contour.
- Seed disturbed areas with Seed Mix (insert specifications below)
- Remove any dams or other devices used to pool water and all litter, trash, and flagging.
- Remove hazardous material containment pads, if used, and dispose of properly.

Open Roads used as Firelines or Contingency Lines:

- Remove vegetation debris (cut limbs and brush) from road cuts and ditches and culvert catch basins and scatter on road fills outside of the travel way. Where excessive amounts of materials prevent scattering, pile or windrow material along the road fill outside of the travel way.
- Restore all existing drainage features, i.e. culverts, rolling dips, cross-drains, belted drains, and ditches damaged during fireline construction.
- Remove debris from culverts that have been blocked or made ineffective due to suppression efforts.
- Grade road surface to reestablish original road widths and ensure a smooth driving surface free of rocks and obstructions.
- Clean ditches and culvert lead-ins during grading activities to remove debris and allow for free flow.
- If dry conditions exist, water roads as necessary during grading activities to ensure missing road surfacing materials and to eliminate generation of additional surface fines.

Restricted (gated or bermed) Roads used as Firelines or Contingency Lines:

- Remove vegetation debris (cut limbs and brush) from road cut5s and ditches and culvert catch basins and scatter on road fills outside of the travel way. Where excessive amounts of materials prevent scattering, pile or windrow material along the road fill outside of the travel way
- Restore all existing drainage features, i.e. culverts, rolling dips, cross-drains, belted drains, and ditches damaged during fireline construction.

- Refer to rental agreements with specific landowners for other requirements.

Vehicle (Weed) Washing Station (if applicable):

- Collect and dispose of all organics, debris, and washing waste in approved landfill.
- Grade road surface to remove ruts and surface imperfections.
- All litter, trash, equipment, and signs will be removed.
- Monitor annually for 2 years. Apply herbicides as necessary to remove weed germinates.

SPECIFICATIONS:

Water Bars:

- Cut water bars diagonal to fire line.
- Ensure that each water bar has a direct outlet and drains into a vegetation or rock filter.
- Utilize Excavators (preferred over dozers if possible) for repair of dozer lines and along roadways that have been cleared for firelines. Dozers may only be used to perform final construction of water bars on dozer lines. Excavators should be used to pull berms and redistribute side cast fills and woody debris (eastside open prairie utilization of Road Graders may be preferred). Dozers may also be utilized on larger safety zones, especially those near roads.
- Water bars for dozer lines should be 12" deep and 18-24" high for the berm. If soil is loose, augment water bar with woody debris and/or rocks if available.
- Hand line water bars should be 8" deep and 12-18" high for the berm. If soil is loose, augment water bar with woody debris and/or rocks.

Fire Line Slope	Suggested Spacing (feet)
10-20%	100
20-30%	75
30-40%	50
40-50%	25
50%+	20

Seeding:

Seed Certification (if applicable)

- Certified, blue-tagged seed shall be used where a name variety or cultivar is specified. Blue tags, that are removed to mix or spread the seed will be saved and provided to the host agencies Resource Advisor.
- All seed purchased will be certified free of seeds from weeds listed on the current "All States Noxious Weeds List".
- The origin of wildland native seeds is verified by a certification of the "Source Identified Class" with an attached yellow tag.

ADMINISTRATIVE RULES OF MONTANA (ARM)

18.10.111 DYED SPECIAL FUEL ALLOWANCE

(1) The department will allow the state of Montana, cities, counties, school districts, and federal and tribal governments to use dyed, low sulphur special fuel on the public roads if the following criteria are met:

(a) The vehicles are owned by a governmental entity (state of Montana, city, county, school district, federal or tribal government) ; or

(b) The vehicles are leased by the governmental entities (state of Montana, city, county, school district, federal or tribal government) and the lease terms meet the criteria for a "long term lease" as defined in ARM 18.10.302.

History: 15-70-104 and 15-70-330, MCA; IMP, 15-70-301 and 15-70-330, MCA; NEW, 1999 MAR. p. 645, Eff. 4/9/99; TRANS, from ARM 18.9.323, 2001 MAR p. 2143, Eff. 10/26/01.

STATE OF MONTANA
DEPARTMENT OF JUSTICE
MONTANA HIGHWAY PATROL DIVISION

Steve Bullock
Attorney General



2550 Prospect
PO Box 201419
Helena, MT 59620-1419

May 10, 2012

Department of Natural Resource and Conservation
Bruce Suenram, Deputy Chief
2705 Spurgin Road
Missoula, MT 59804

Dear Deputy Chief Suenram:

The Montana Highway Patrol (MHP) recognizes the need for fire program vehicles owned and operated by the Department of Natural Resources and Conservation (DNRC). We agree that these vehicles are imperative to the protection of our wild lands and they are used to respond to fires in an emergency capacity. Therefore, MHP endorses the use of the fire program fleet and authorizes their emergency vehicle status.

Thank you for contacting the MHP office with your request for authorization. If you have any questions or concerns, you can reach our Headquarters office at 406-444-3780.

Sincerely,

A handwritten signature in cursive script, appearing to read "Michael Tooley".

Colonel Michael Tooley
Chief Administrator

mtt/kln

RECEIVED

MAY 14 2012

Forestry Division
Missoula

Telephone (406) 444-3780 Fax (406) 444-4169





Montana Department of
Natural Resources and
Conservation

Remote Automated Weather Station Operating Plan

Introduction

The Montana Department of Natural Resources and Conservation Fire Program has been taking weather observations almost since its inception. Fire weather data is a critical component of fire management decisions and firefighter safety. Automated Remote Automated Weather Stations (RAWS) provide weather data including temperature, humidity, precipitation, wind, fuel moisture and solar radiation on an hourly basis to a variety of users. This plan was developed to outline procedures related to the operations, procurement and maintenance of RAWS stations owned by the Montana DNRC.

Data from Montana DNRC weather stations is used for a wide variety of applications including National Fire Danger Rating System (NFDRS) indices, fire behavior, prescribed fire, climatology and other general forecasting applications. Because of this, Montana DNRC has adopted the following documents as common standards in supplement of this Operating Plan:

- Interagency Wildland Fire Weather Station Standards & Guidelines, January 2014 (PMS 426-3)
- Gaining an Understanding of the National Fire Danger Rating System, July 2002 (PMS 932)

Objectives

The objectives of the Montana DNRC RAWS program are to:

- Develop and maintain a fire weather station network to collect the meteorological data necessary to support fire danger rating and fire management decisions for the Montana Department of Natural Resources and Conservation.
- Ensure that all DNRC owned RAWS stations are operated within compliance of national standards and procedures.
- Define the roles and responsibilities within Montana DNRC RAWS program
- Encourage the development of and participation in NFDRS plans at the Land Office or Zone Levels.
- Provide a framework for identifying program needs and implementing upgrades to the existing network.

Current Operations Overview

Montana DNRC is currently operating 7 RAWS stations across the state.

Station Name	Station Type	WIMS ID	Land Office & Unit	Lat. x Long	Elev.	Installed	10 yrs
Fisher River	RAWS		NWLO-Libby	48.3833 x 115.5667	2070		
Boorman	RAWS		NWLO-Kalispell	48.1439 x 114.1718	3963		
Stillwater	RAWS		NWLO-Stillwater	48.5394 x114.5594	3116		
Clearwater	RAWS	241520	SWLO-Clearwater	47.0136 x113.3331	3839		
Harvey Grouse	RAWS		SWLO-Missoula	46.6642 x113.4239	5386	2009	2019
Yankee Flats	RAWS		SWLO-Anaconda				
Dearborn	RAWS		CLO-Helena	47.1328 x111.9008	3527		

Roles and Responsibilities

Fire Bureau RAWS Program Administrator

A member of the Fire & Aviation Management Bureau staff will function as the program administrator for the Montana DNRC RAWS program. The RAWS Program Administrator will deal primarily with four key facets of the Montana DNRC RAWS program.

1. RAWS Site Determination and Interagency Coordination

The Montana DNRC RAWS program is a contributing member of the national RAWS system, and interagency cooperation is integral to continued program success. The Montana DNRC RAWS Program Administrator is responsible for maintaining and enhancing this partnership. In addition to serving as the single point of contact for interagency RAWS concerns, the program administrator will work with RAWS program partners to ensure that Montana DNRC RAWS data and stations meet NFDRS standards and that new stations are located in sites that will provide benefit to both the DNRC and the RAWS system as a whole.

2. Financing and procurement

Funding for new RAWS is typically provided by the FAMB. The RAWS program administrator will assist in obtaining authorization for new RAWS purchases as well as facilitate procurement of RAWS.

3. Maintenance Contract

Currently, Montana DNRC maintains a contract with the BLM RAWS depot for standard maintenance and sensor replacement. The RAWS program administrator will coordinate this contract or other maintenance scenario on a statewide basis. Coordinating maintenance on a statewide basis will eliminate redundancy, increase efficiency and streamline the maintenance process.

4. Quality Assurances

Provide oversight to ensure annual maintenance is preformed and that stations meet NFDRS standards.

Recommended Training:

- Advanced National Fire Danger Rating Systems,
- S-491 Intermediate National Fire Danger Rating Systems
- Basic WIMS

Land Office RAWS Coordinator

Each Land Office will identify a single Land Office RAWS Coordinator to act as the single point of contact on their land office and facilitate communications between the individual Units and the RAWS program administrator. Land Office RAWS Coordinators will coordinate and facilitate RAWS usage across their respective areas. Primarily, this will consist of:

1. RAWS Site Determination, Procurement, and Installation

Each land office administrator will be responsible for assisting their Units in establishing RAWS sites based on NFDRS Plans, procuring RAWS, providing cost estimate and providing technical support during

station installation. The land office administrator will work directly with the RAWS Program Administrator to fund and procure Unit RAWS and ensure that site selection is coordinated to best meet the needs of the Unit and the national RAWS system.

2. Station Catalog and Data Management

Land office administrators are responsible for obtaining station IDs, establishing station catalogs in WFMI, and ensuring that data is flowing upstream in compliance with NFDRS and national RAWS standards. The land office administrator is also responsible for each station in WIMS and shall be listed as the station owner. In some occasions, actual WIMS data management may be accomplished at the respective Unit or interagency dispatch center.

3. Station Maintenance

Each land office administrator will be responsible for assisting their Units in obtaining and replacing sensors via the statewide contract. The land office administrator will be the single point of contact with the BLM RAWS depot and station vendor for all RAWS located on their land office.

Recommended Training:

- Advanced National Fire Danger Rating Systems,
- S-491 Intermediate National Fire Danger Rating Systems
- Basic WIMS

Unit Level Manager/Technician

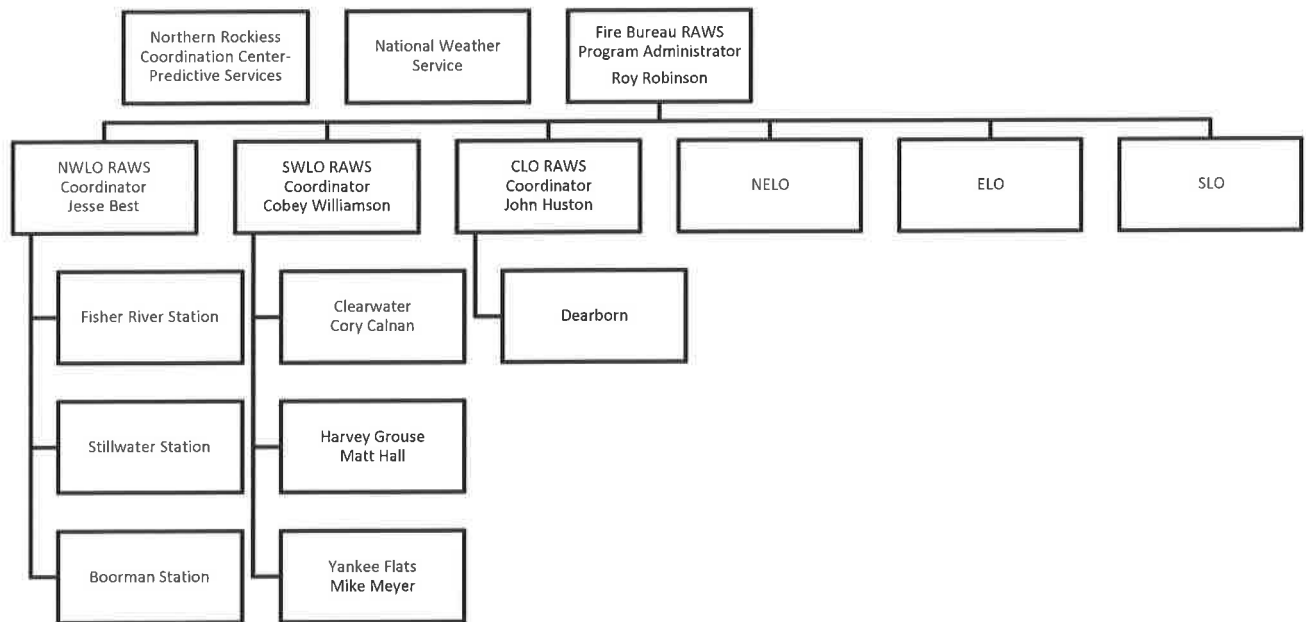
For each Unit where a RAWS is located, a single point of contact will be identified to communicate concerns relating to their RAWS. For RAWS stations on their Unit, this individual:

1. Will be listed in WFMI as the Alternate Point of Contact.
2. Performs minor weather station maintenance/repairs as requested or needed
3. Responsible for performing yearly site maintenance including replacing sensors, fuel sticks ect.
4. Ensures site visits are accurately reported to the Land Office Coordinator in a timely fashion.

Recommended Training:

- S-491 Intermediate National Fire Danger Rating Systems
- Basic WIMS

Montana DNRC RAWS Organization



Operational Procedures

Funding

As funding allows the DNRC Fire and Aviation Management Bureau will purchase RAWS stations in support of a DNRC weather station network in accordance with the proposal process listed below. FAMB will provide for the funding and upkeep of all DNRC owned RAWS stations to ensure they meet NWCG and NFDRS standards through annual maintenance contracts. All site specific needs (fencing, improvements) will be the responsibility of the Land Office/Unit.

Land Offices may purchase RAWS stations through their respective budgets but should follow the process outlined below when determining locations

Proposals for new Weather Stations

When determining a location for a new RAWS station; Land Offices/Units shall consult with the local NFDRS plan and the Northern Rockies Coordinating Group Predictive Services Meteorologists to determine optimal sites and elevations. All Units/Land Offices should identify primary and secondary sites for any new proposals.

New proposals should also include the following information:

- Type of Station
- Desired sensor compliment (all stations will be required to have the minimum NFDRS sensors for compliance)
- Power source (Solar or Hardwire)
- Permanent or Portable
- Type of base (Lunar module or post)
- Estimated cost

These proposals will be developed in conjunction with the Land Office RAWS Administrator who will then forward them to the FAMB RAWS Coordinator for consideration. The FAMB RAWS Coordinator will prioritize requests and provide a recommendation to the FAMB for funding.

Procurement and installation of new DNRC owned RAWS stations will be prioritized as follows:

1. Greatest need, holes in coverage or lack of data as determined by local NFDRS Plans for DNRC operations
2. Greatest need, holes in coverage or lack of data as determined by local NFDRS Plans for cooperators and other agencies
3. Replacing critical manual stations.

Weather Station Maintenance

Annual service of NFDRS RAWS stations provides an opportunity to ensure general station integrity and to perform necessary preventative maintenance. All Montana DNRC owned RAWS stations will be maintained in accordance to processes and procedures outlined in the 2014 version of the "Interagency

Wildland Fire Weather Station Standards & Guidelines (PMS 426-3)". The FAMB will maintain an annual maintenance contract with the Boise RAWS Depot for all DNRC owned RAWS stations.

To maintain NFDRS compliance requirements, each DNRC owned RAWS station will receive at a minimum, one site visit per year. A site visit is usually accomplished when the Unit/Land Office is completing sensor change out early each summer prior to the sensors calibration expiration. The Land Office RAWS Administrator will coordinate these visits and ensure that the site visit is logged in WFMI.

For all DNRC owned RAWS stations, local users will reset the annual precipitation on the station Data Logger as close to October 1st as feasibly possible.

Efforts shall be made to train Unit/Land Office staff in the proper maintenance of RAWS stations through local and regional training opportunities.

Operation

The optimal operating period for all weather stations used for NFDRS calculations is year round. However the minimum operational period for all DNRC owned RAWS stations shall be as follows:

A minimum 30 day start up period prior to the need for NFDRS indices and the regular spring green-up period through a season ending event in the fall, usually determined by snowfall or significant rainfall.

Units/Land Offices should work with their local interagency intelligence dispatcher to provide data publishing year round.

NFDRS and FDOP Plans

Land Offices and Units shall prepare or participate in local NFDRS and Fire Danger Operating Plans. These plans are used to identify the decision-making process for agency administrators, fire managers, dispatchers, agency cooperators, and firefighters by establishing planning and response levels using the best available scientific methods and historical weather/fire data. In addition, these plans outline procedures for developing seasonal risk analysis and define fire severity trigger points.

At a minimum, the NFDRS/FDOP should contain the following information:

- Area Roles and Responsibilities
- Historical Fire & Weather information
- Fire Danger Rating Inventory
- Operational Procedures
- Climatic Breakpoints and Fire Business Thresholds
- Staffing Levels
- NFDRS Indices to be used (Burning Index, Energy Release Component, Spread Component, or Ignition Component)

- Adjective Fire Danger Rating thresholds

Future Planning/Program Needs

Looking into the future DNRC will use a collaborative effort between other local, geographic and agency members when choosing locations for new RAWS stations and the need to move or remove stations from service. In all cases new RAWS stations should be situated to provide a benefit to DNRC operations first and then as will benefit to interagency partners.

PREVENTING SPREAD OF AQUATIC INVASIVE ORGANISMS (AIS) COMMON TO THE STATE OF MONTANA

OPERATIONAL GUIDELINES FOR FIRE ACTIVITIES

Why? Firefighter and public safety is still the first priority, but aquatic invasive plants and animals pose a risk to both the environment and to firefighting equipment (some species can clog valves and pumps if equipment is not completely drained or treated). Avoidance and decontamination can prevent the spread of these organisms.

PREVENTION GUIDELINES

Preventing exposure to AIS through best management practices (BMP) is the easiest and simplest way to control their spread. These guidelines were primarily developed by US Forest Service personnel to help their fire managers avoid the spread of aquatic invasive species. The Montana DNRC altered and added to the original Forest Service source document to meet the DNRC's needs and to incorporate guidance previously developed within that agency. Many of the best management practices presented here are currently under review by the National Wildfire Coordinating Group for adoption. In the interim, the NRCG suggests that member agencies apply these guidelines to fire operations in the Northern Rockies.

GENERAL PREVENTION

Know the distribution of aquatic invasive organisms in watersheds where the operation will take place (Figure 1). See the following link to the Department of Fish Wildlife and Parks AIS species locations in Montana: <http://fwp.mt.gov/fishAndWildlife/species/ais/speciesId/default.html>

- You can never be certain that invasives are NOT present, but at least you will know ahead of time where they ARE known to be present.
- Fill tanks from municipal water sources whenever possible.
- When possible, avoid drafting from waterbodies with known infestations of aquatic invasive species.

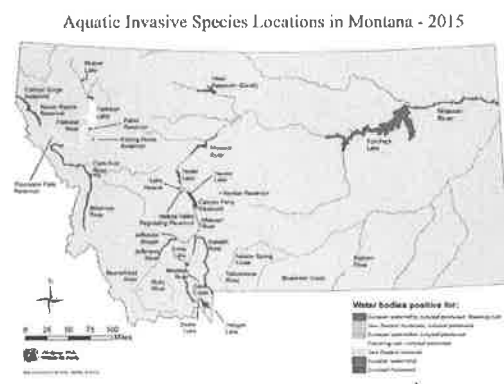


Figure 1. Map distribution of aquatic invasive species on your unit!

- Avoid transferring water between drainages or between unconnected waters within the same drainage. Do not dump water from one waterbody (e.g., stream, lake, or reservoir) into another waterbody.
- Avoid sucking organic and bottom material into water intakes when drafting from shallow water. Use screens. If collapsible tanks can be filled with municipal water, draft from those tanks instead of raw water sources.
- Avoid obtaining water from multiple sources during a single operational period unless drafting/dipping equipment is decontaminated or changed out with clean equipment between sources.
- If contamination of equipment with raw water or mud/plants is unavoidable, see 'Decontaminating Ground Equipment' and 'Decontaminating Aviation Equipment', below.

GROUND OPERATIONS

Of great concern for ground equipment is the possibility that residual tank water contaminated with AIS could be transferred to uncontaminated waterbodies during the drafting process.

However, if proper drafting and water handling BMPs are used and foot valves are working correctly, there is low risk that contaminated tank water could "seep" into the drafting water source. We do NOT recommend decontamination of engine or water tender tanks.

- When possible, fill engines from a municipal hydrant, a water tender, or from a pump assigned to a single drafting source.
- When spraying water to suppress a fire, avoid application of untreated water into local water bodies (ponds, lakes, rivers, streams, wetlands, seeps, or springs), especially if the water came from a different watershed (Figure 2).
- To prevent leakage and to maintain the prime, be sure that foot valves are screwed snugly onto drafting hoses, closed fully and are not leaking before and during drafting (Figure 3). If foot valves are leaking, refrain from drafting; and replace foot valve with one that is



Figure 2. Water delivery equipment is low risk if contaminated water is pumped onto a fire and not applied to another waterbody.



Figure 3. Be sure foot valves are not leaking before and during drafting.

operating properly. See *Appendix B* for methods to field test foot valves for leakage.

- Priming the engine pump for drafting— To minimize the potential for engine water leakage through the foot valve, prime with water from the drafting source rather than water from the engine tank (Figure 4). When priming with a bucket, first make sure that the bucket is dry and is itself not a vector for AIS. Additionally, during drafting and water tending operations, don't leave draft hose full with foot valve engaged and submerged in water source when not pumping.
- Elevate foot valves above the bottom of the waterbody for clean, sediment-free operation—for example, duct tape foot valve to a shovel or place the valve in a hard hat or bucket.
- Remove water drain plug/s from self-priming pumps (e.g., trash pumps) to empty pump housing before moving to a new waterbody.
- When filling the engine tank, avoid tank overflow into the water source.



Figure 4. To minimize risk of engine water leakage through foot valve, prime with water from the drafting source rather than from the tank.

DECONTAMINATING GROUND EQUIPMENT

- Before moving to a new water source (in a different watershed), decontaminate all external and internal surfaces of foot valve and draft hose. Three options are:
 - Dry the gear until dry to the touch (sunlight accelerates the process).
 - OR use hot water (140° F, or hotter) and allow spray to contact surface for 5 to 10 seconds [up minutes preferred]).
 - OR use a chemical solution (see *Appendix A: "Decontaminating with Chemical Disinfectants"*). All internal and external surfaces of the drafting hose with foot

valve can be decontaminated by coiling and submerging in a bucket filled with disinfectant (Figure 5).



Figure 5. If drying or hot water are not options, draft hoses with foot valves can be decontaminated by submerging in a bucket filled with disinfectant.

to 5

- Consider carrying spare, clean, dry draft hoses and foot valves to switch out with used ones when moving to a new water source.

AVIATION OPERATIONS

Aircraft such as air tankers and single engine air tankers, which use water from municipal sources, are unlikely to encounter AIS and are not addressed here. All other aircraft utilize untreated water and have the potential to transfer AIS.

GENERAL

- Avoid dipping or scooping water from multiple water sources within the same operational period to minimize cross-contamination of water sources.
- If possible, use water dipped from the same drainage that it will be dropped in. This can be accomplished by setting up heliwells (portable tanks/pumpkins) filled from small streams with portable pumps.
- Use deeper (blue) water whenever possible. Avoid areas that will intake mud or plants.
- Switch out a contaminated helicopter bucket with a clean bucket before moving to a new water source. Alternating used (possibly contaminated) helicopter buckets with spare (clean) buckets can save time and increase efficiency, as the first bucket can be decontaminated while the second bucket is being used.
- Helicopter snorkels do not need to be primed, with either source or tank water, so there is no risk of residual tank water entering a water source during drafting operations (Figure 6). However, snorkels and foot valves that encounter untreated water must be decontaminated between drainages (see below).



Figure 6. Helicopter snorkels, such as on this Sky Crane, do not need priming so no risk of tank water leakage during drafting. However, snorkels and foot valves that touch untreated water must still be decontaminated between drainages.

DECONTAMINATING AVIATION EQUIPMENT

Chemicals such as bleach and quaternary ammonium compounds do not meet corrosion requirements for aluminum and **shall not** be used in aircraft.

- Visually inspect water handling equipment (snorkel hoses, pumps, foot valves, screens, buckets, intakes & tanks) daily, during maintenance, and after every water dropping mission, when possible.

- Remove visible plant parts and mud from external surfaces. Power wash all accessible surfaces with clean water (ideally, hot water 140°F or hotter for 5 to 10 seconds [up to 5 minutes preferred]). Power washing greatly reduces the likelihood that any target aquatic invasives remain. Chemical treatment of external surfaces is not recommended.
- When contact with untreated water has occurred or is suspected, clean and decontaminate accessible, exposed surfaces with hot water (140°F) or hotter for 5-10 sec (up to 5 minutes preferred) before moving to new, unconnected water sources or new incidents. When hot water (140°F) is not available or practical, use potable water to flush invasive species from the system. Ensure that run-off cannot reach a water source.
- Thorough drying alone is an easy and effective decontaminating method, though required drying times can vary with equipment materials (e.g., metal, rubber, fabric). Dry gear until dry to the touch. Drying may not be possible for a quick turnaround, so carry spare, clean gear to switch out with wet gear.
- Decontaminate internal tanks by spraying the internal surface with hot water (140°F) or hotter from a hot washer or 'Hotsy'. Allow spray to contact surface for 5 to 10 seconds (up to 5 minutes preferred). This method is recommended for scooper and Fire Boss aircraft (Figure 7). Tanked helicopters have tank doors that open widely from below for easy tank access and draining. Hot water spray or thoroughly dry these surfaces.

DECONTAMINATING ACCESSIBLE INTERNAL TANKS

Accessible tanks have doors or other openings that allow access for cleaning. Scooper aircraft (CL215 or CL415, and Fire Boss), Sky Crane helicopters (CH-54/S-64), and other tanked helicopters are examples of aircraft with accessible tanks.

STATE OF MONTANA DNRC HELITACK OPERATIONS

Aquatic Invasive Species (AIS) are easily transported in a variety of ways (i.e. helicopter buckets, fixed tank helicopters and SEATs utilizing open water sources, engines and tenders, and other water handling equipment). Agency personnel should become knowledgeable in the preventive measures associated with the prevention of the spread of aquatic plants and invertebrates.

Montana Fish Wildlife and Parks determined that invasive species need water to survive. Exposure to sunlight and elimination of residual water will prevent the transfer of (AIS).

According to the United States Forest Service, the transfer of (AIS) can also be reduced by removing plants and killing the micro-organisms left on the bucket with the use of a bleach and water mixture. (Although there are other products available, bleach and water is the most cost effective solution).



Figure 7. A CL-415 scooper plane fills its belly tanks [inset]. Workers decontaminate belly tanks of CL-415 scooper plane by spraying hot water from a high pressure wand and a portable hot washer, or 'Hotsy'

Montana Helitack will take a pro-active approach in the effort to reduce the transfer of Aquatic Invasive Species from one water source to another.

PROCEDURES

I. Initial Attack

Helitack's mission is to protect firefighters, civilians, private property, and Montana's natural resources from wildland fires. We recognize the importance of protecting our water sources from AIS.

Pilots will use water sources as they deem necessary for the mission.

During high fire activity we will follow the following steps:

- 1) **PREP**
When time permits and the helicopter lands with the bucket deployed (such as refueling operations), open the bucket as much as possible to expose to air and sunlight.
- 2) **INSPECT**
Inspect the bucket for mud, water, and vegetation that could carry aquatic invasive species.
- 3) **CLEAN**
Remove all mud, water, and vegetation as much as possible. No need to use soap or chemicals.
- 4) **DRY**
Aquatic invaders can survive only in water and wet areas. By drying the bucket thoroughly, most invasive species will cease to exist. The longer the bucket remains in direct sunlight the better.

II. Post Flight or Re-Comp

When practical, after the last fight of the day or at the start of the following day, the bucket should be sprayed down with a 6% bleach/water solution and allowed to dry completely before handling.

WARNING:

DO NOT USE GRANULATED/POWDERED BLEACH. Granulated/powdered bleach could have adverse effects when in contact with fuel products and will not be used. Refer to Appendix A for alternative solutions when liquid bleach is not used.

A. Equipment Needed:

- 1) Rubber Gloves
- 2) Goggles
- 3) Measuring cup – marked for 2.5 cups
- 4) 2-Gallon weed sprayer w/warning label (poison)

- 5) Liquid bleach (2.5 cups)
- 6) Water (2 gallons)

WARNING:

Liquid Bleach will cause blindness if splashed in eyes. Use goggles and rubber gloves when mixing solution.

CAUTION:

Liquid bleach will stain/discolor/damage equipment. Mix solution 50 feet away from equipment. Use rubber gloves to protect hands. DO NOT use flight gloves or leather gloves.

For the lack of better terms 100% bleach can cause a real mess. Ample drying time for the bucket is truly desired as we do not want to replace expensive fire pants or t-shirts that come in contact with bleach.



B. Mixing Instructions:

- 100% bleach is a poison and an additional hazard to have on the fuel tenders. Therefore, we will mix at home station and transport the diluted solution on the fuel tender to have available in the field.
- Wear goggles and rubber gloves when working with bleach.
- Use extreme care to prevent getting bleach on clothing as it will discolor or stain.
- Mixing will be accomplished 50 feet away from aircraft and/or fuel tender.

6% MIXING RATIO

1 1/8th cups (9 ounces) of bleach to 1 gallons of water

- 1) Pour 2 1/4th cups of liquid bleach into weed sprayer.
- 2) Add 2 gallons of water to weed sprayer

C. Application:

- 1) Move bucket 50 feet away from any equipment.
- 2) Remove tie-down strap (if installed).
- 3) Open bucket and extend cage.
- 4) Completely remove all mud, water, and vegetation.
- 5) Wear goggles and rubber gloves when working with bleach.
- 6) Lightly spray solution onto bucket inside and out.
- 7) Allow bucket to completely dry before handling.

- 8) Collapse cage and close bucket.
- 9) Reinstall (install) tie-down strap
- 10) Stow bucket on aircraft.

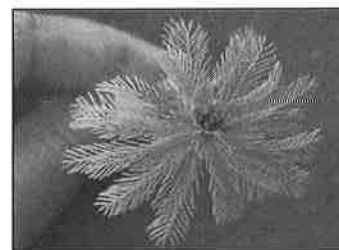
III. Contaminated Dip-sites

NOTE:

Dip-sites that have a confirmation of AIS may be used, however; the bucket will be cleaned with bleach/water solution prior to changing dip-sites.

- A. Resource advisors on large incidents may identify dip-sites that contain AIS. Montana Helitack personnel will comply with the incident's requests for bucket sterilization using our methods and procedures mentioned in section II of this appendix.

This procedure presents a practical approach for Helitack to help prevent the spread of Aquatic Invasive Species.



Appendix A: Decontaminating with Chemical Disinfectants

Chemical disinfectants, though effective, can be hazardous, corrosive, and difficult to dispose of. However, when other decontamination methods, such as hot water or drying, are not options, chemicals can be used for small gear items **ONLY** (e.g., footvalves, draft hoses, or screens) in volumes appropriate for small buckets.

Quaternary ammonium compounds (quats), common cleaning agents used in homes and hospitals, are safe for **MOST** gear and equipment when used at recommended concentrations and rinsed. Chlorine products such as bleach, are acceptable to use in addition to the products listed below. It is important to note that chlorine products may cause corrosion to occur in fabrics, plastics, rubber, and metal and they have limited effectiveness against snails. However, bleaches are extremely effective against certain invasive organisms.

To decontaminate gear with quat disinfectant:

The quaternary ammonium formulations *Super HDQ®* and *Green Solutions High Dilution256®* (which replaces the discontinued *Sparquat 256®*) were recently (see *Appendix D*, Stout et al. 2016) found to be most effective against a variety of AIS. They

can be used at concentrations according to the label (see below). Soak gear in a bucket for 10 minutes. Alternatively, gear may be disinfected by spraying with quat from a backpack weed sprayer. Afterwards, **rinse gear thoroughly in clean water**. Quat compounds are highly toxic to aquatic organisms but are immobile in soil. Keep effluent containing this product at least 100 feet from lakes, ponds, streams or other waters. Do NOT allow product to enter storm drains, lakes, streams, or other waterbodies.

Volume of tap water	Super HDQ®	Green Solutions High Dilution256®	Soak Time	Spray Time
1 gallon water	½ oz	½ oz	10 min	5 sec spray; let stand 10 minutes; rinse
1 gallon water	1 Tbsp.	1 Tbsp.	10 min	5 sec spray; let stand 10 minutes; rinse

To decontaminate gear with chlorine bleach:

Bleaches are corrosive to canvas, gaskets, and metal and have limited effectiveness against snails. However, bleaches are extremely effective against other invasive organisms, especially pathogens, and the bleach concentration below has been found to be effective for chytrid fungus and other AIS (see *Appendix D*, Johnson et al. 2003). Soak gear in a bucket for 10 minutes. Afterwards, **rinse gear thoroughly in clean water**.

Volume of tap water	"Regular Clorox® Bleach" (6% sodium hypochlorite)	Soak Time
1 gallon water	9 oz	10 min
1 gallon water	1 1/8th Cups	10 min

Chemical Disposal

Small quantities of diluted quaternary ammonium products or bleach which have been used to disinfect foot-valves or other fire-fighting equipment may be disposed of in a sanitary sewer **as allowed by the product label**. Alternatively, used solutions of quaternary ammonium products or bleach may be disposed of by any application specified on product label direction, such as:

- Cleaning vehicle exteriors and tires by applying diluted materials through a high pressure system
- For the prevention of mildew on non-porous surfaces
- Disinfection of toilets (including portable)

Always consult the product label in determining the appropriate Personal Protective Equipment necessary for the mixing and use of these chemicals, and for final direction on a given products use and disposal. Do NOT allow these products to enter storm drains, lakes, streams, or other waterbodies.

Appendix B: Field Testing Foot Valves for Leaks

Background information:

Aquatic invasive species (AIS) can be found in the untreated water sources used in firefighting operations, either a natural source (a river or lake) or a human-made water body (a reservoir, canal, or stock tank). Untreated water sources may harbor a variety of AIS, including quagga and zebra mussels, New Zealand mud snails, whirling disease, didymo (*rock snot*), and many others.

Of great concern for ground equipment is the possibility that residual tank water contaminated with AIS could be transferred to uncontaminated waterbodies during the drafting process. One best management practice to reduce this potential is to be sure that foot valves are screwed snugly and not leaking before and during drafting. The following protocol outlines a simple method that can be implemented in the field.

Equipment List

Some items may be part of an engine's supplied equipment. Other items may need to be purchased but are easily found at fire equipment vendors. Items needed to perform the leak test include:

- Foot valve
- Suction hose
- Assorted male-to-female adapters, increasers, and reducers
- 1 ½" Pump Test Kit with Gauge – CFE (Cascade Fire Equipment) P/N: 11495; or similar
- 1 ½" 90 Degree Elbow – CFE (Cascade Fire Equipment) P/N: 10251-90; or similar
- 1" ratchet straps

Low Pressure Test (3-5 psi)

To perform the low pressure test, fasten a 9' length of suction hose to the access ladder located on the rear of the engine (Figure 1). Use ratchet straps or another suitable method, as long as the suction hose is attached safely and securely to the ladder.

To adjust for size of the foot valve (e.g., 1½", 3"), use a combination of male-to-female adapters, increasers, and/or reducers to attach the foot valve to the suction hose (Figure 2). Fill the suction hose completely with water; the weight of the water will provide a pressure of 3-5 psi. Check the foot valve. There should be no leakage. If leakage occurs, replace the foot valve with one that does not leak.



Figure 1. Suction hose with foot valve attached to engine ladder.

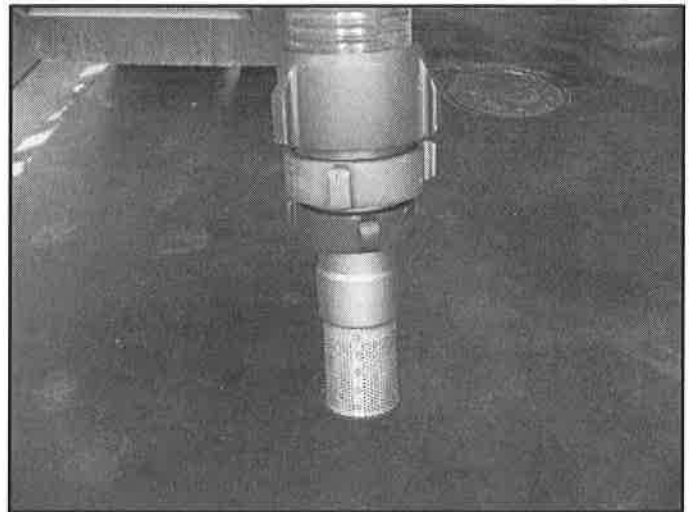


Figure 2. Foot valve attached to suction line with various adapters as needed to adjust for foot valve size.

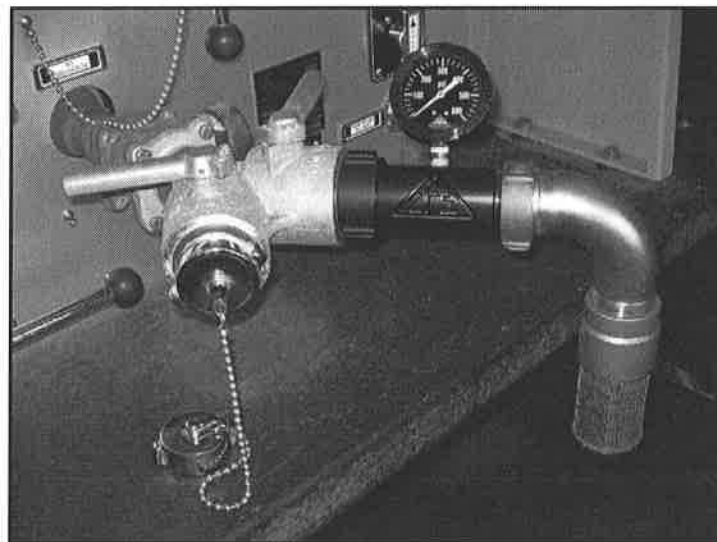


Figure 3. Pressure valve attached to the foot valve.

High Pressure Test (130 psi)

To perform the high pressure test, first attach a wye or other suitable shut-off valve to the rear discharge (Figure 3). Attach the *CFE Pump Test Kit with Gauge* to the shut-off, then attach the *CFE 90 degree Elbow*. Lastly, attach the foot valve to be tested to the elbow. The test set-up should resemble the one shown in Figure 3.

Using the engine's pump, increase the pressure until the *CFE Pump Test Kit Gauge* indicates 130 psi. Check the foot valve. There should be no leakage. If leakage occurs, replace the foot valve with one that does not leak.